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RELATING TO

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LETTERS OF RUSTICUS ON NATURAL HISTORY

EDITED BY

EDWARD NEWMAN, F.L.S., F.Z.S.,

LATE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY.

This work more especially relates to those insects (generally known under t name of blight) which are so injurious to our most valuable crops, as TURNIPS, APPL HOPS, &c., &c.

PORTION OF CONTENTS.

Blights, or Insects injurious to Vegetables. Gooseberry Grub; the Fly describe Laying the Eggs; the young Grub; Voracity of the Grub; the Grub described; Chan of Skin; Burrows in the Earth; Popular Remedies. Aphis or Plant-Louse; Injury causes; Economy of. Hop-Fly; Influence on Crop of Hops; Influence on the Dut First Appearance of; Insect Enemies of; Remedies. American Blight. Apple-Weev Description of; Economy of; Remedies. Apple-Moth. Apple-Grub; Economy Little Ermine Moth. Yellow-Tail. Turnip-Fly; Destructive Powers of; Economy o Remedies. Turnip-Nigger; Description of the parent Fly; Economy of; Description the Grub; Remedies. Turnip-Weevil. Turnip-Aphis. Aphides in Apples, Poplar-leav and on Roots. Ants and Aphides.

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Extracts from the Letters of the late William Arnold Bromfield, M.D., *to his Sister.*

Rather more than six years have passed away since the universally lamented death of Dr. Bromfield. His wanderings in pursuit of Natural-History knowledge either in his own country,—more particularly his native Island, the Isle of Wight,—or in the wider field of the West Indies, the United States, Egypt and Palestine, occupied almost the whole of his life after he had arrived at manhood. He entered Egypt on the 18th of October, 1850, ascended the Nile, reached Cairo on his return on the 11th of June, 1851; passed onward to the Holy Land, reached Beyrout on the 22nd of September and left that place on the 28th, "sleeping that night at Zahleh and arriving the next day at Baalbec ill through long fasting, his servant having omitted to take the requisite provision for the journey. The following night he was seized with diarrhœa, from which he suffered without intermission until he reached, on the 1st of October, the house of the Rev. J. L. Porter at Bludan, the summer station of the Mission, where he was assiduously attended by Dr. Paulding.

"Efforts were made to dissuade one so unfit to travel from proceeding to Damascus; but the combined illness of Mr. and Mrs. Porter, and probably the restlessness induced by fever, determined him to press on to that city. The journey seems to have greatly increased the malady, and his recovery became, humanly speaking, hopeless.

"On reaching the Hotel de Palmire, his symptoms were rapidly aggravated, and assumed the form of malignant typhus; while the sufferer was watched during the brief remainder of his life, with the kindest Christian care, by the Rev. James Barnett, and by Mr. George Moore, an English traveller, who, under most trying circumstances, volunteered his help to a fellow countryman."

He died at Damascus on the 9th of October, 1851. No man ever lived who attracted more entirely the affections of all who knew him; he was of the most affectionate disposition, mild in his manners, sincere, kind and considerate to all, of unwearying assiduity, of the most invincible industry and the most ardent lover of truth: this latter quality led him, during his voyage on the Nile, very frequently to deprecate the high-flown terms with which previous travellers had uniformly spoken of the antiquities of Egypt; and so great was the confidence placed in the veracity and judgment of Dr. Bromfield, that, among his friends, this modified estimation of Egyptian antiquities

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became prevalent, and lasted until the photographs of Francis Frith told silently, but with a power not to be questioned, a very different tale, and Egypt is again restored to that estimation as a land of wonders which she had previously held. Dr. Bromfield's erroneous estimation of these wonders has been held by some as a want of candour, but those who know him best well know the utter fallacy of such a conclusion; he was annoyed and disgusted by the bombastic phrases of conceited travellers, and his extreme love of truth revolted at the inflated descriptions he had read. His truth-seeking mind required a greater degree of exactitude than is to be found in any record published up to the time of his visit: had he only seen the photographs of Frith, unaccompanied by description, how different would have been his feelings. There is not a greater proof of the estimation in which Dr. Bromfield's intense love of truth was held than the effect produced by his criticisms on the antiquities of Egypt. I confess myself to have been an unhesitating convert to his views, and that I greatly under-estimated these antiquities until I beheld their portraits painted by themselves: that evidence who shall dispute?

A truly affectionate sister received these letters during her brother's last journey, and has printed them for private circulation only, distributing the copies among the writer's friends. From one of them, with which the editor of the 'Zoologist' has been favoured, the following interesting passages are extracted.—*Edward Newman.*

Animal possessions of the Egyptians. — Camels, dromedaries, donkeys and huge buffaloes, with a few dark brown sheep, are their chief possessions; the buffaloes may be seen continually lying in mid river, with their noses alone out of the river, or swimming across to the opposite bank, quiet inoffensive animals, used both for draught and burden. We remarked many persons ploughing with a camel and a buffalo yoked together in most ill-assorted fellowship. Dovecotes, swarming with myriads of pigeons, rose high above the houses in some of the larger towns, of a conical shape, like immense hay-stacks, and pierced with innumerable holes for the birds to enter in and come out. Pigeons are a great article of consumption in Egypt, where poultry takes the place of butchers' meat in a great measure.—p. 31.

Crocodiles in the Nile.—Nearly coequal with the limits of the Doum palm is the line that bounds the distribution of the crocodile northwards at the present day, for in ancient times it would appear to have ranged much lower in the Nile, and it is said to have even inhabited the Delta, and Lower Egypt properly so called. In our day the crocodile is said first to make its appearance at or near Osiout, but we saw none of them during our stay at that city; but on Sunday morning (December 14) on arriving about a quarter of a mile from a sand-bank, which we learned from our boatmen was a favourite resort of these reptiles, and which is a little beyond Girgeh, between that town and Farshoot, we had the gratification of seeing a whole herd, if I may use the term, of these river monsters emerge one by one from the stream as the sun gained power, and assemble on the sand-bank, where we soon counted no less than sixteen of various sizes, huddled together, and evidently enjoying the warmth of the bright and unclouded morning ray. The smallest of those we saw, as we watched them through our telescopes, seemed to be at least eight or nine feet in length, and several were absolute leviathan monsters, as hideous and terrific as can well be imagined, not less certainly than sixteen and eighteen feet long, with bodies as thick as that of a horse; the huge jaws of some gaping wide apart as they lay listless and motionless on the sand, or occasionally dragged themselves forth from the water to lie along like huge logs or trunks of palm trees, to which they have no inconsiderable general resemblance in the rough and scaly covering of their unwieldy forms, knotted with crested protuberances. We were so near them, that by the aid of our telescopes we could perfectly watch their motions, and discover their minutest characters, longing all the time to be amongst them with our guns, and planning an attack we intend making on their stronghold when we return down the river. We propose to throw up a masked battery of sand the day previous to our attack, and landing on the beach before day-break the following morning, to open fire on them from behind our temporary fort as they come up out of the river to bask in the sun. We have furnished ourselves with balls of hardened lead expressly for the purpose, and trust to be able to achieve the feat of shooting a crocodile, and carrying off his jaws and scull as trophies of our campaign against the ancient monster deities of Egypt's river. The young specimens of the crocodile of the Nile that are occasionally brought alive to England give no idea whatever of the hideous deformity and ferocious aspect of the full-grown animal. A more revolting creature does not exist; yet, I believe, that to man they are seldom, if ever, dangerous, being extremely watchful and timid, waddling slowly down to and sliding into the water, on the too near approach of any person; and we observed the sand-banks occupied by numbers of aquatic birds, geese, cranes, pelicans, &c., walking about the outstretched monsters as if possessed with a feeling that they were in no peril of their lives in the society of these ugly reptiles. A boat, in rounding the bank, fired a gun at the crocodiles, but not within range, which had the effect of sending them all pell-mell into the water, but in a few minutes afterwards the noses of one or two might be seen emerging, and soon the sand-bank became re-peopled with the fugitives. We little expected at this season to find crocodiles half so numerous, seeing how cold the mornings are now, and how low the temperature of the Nile is, compared with that which it obtains a few months later or earlier than the present.—p. 86.

Critique on Popular Views of the Zoology and Vegetation of the Nile.—The ornithology of the Nile is, as to its subject, less susceptible of exaggeration than its zoology, for the multitudes of water-fowl that haunt its stream may justify the use of the word "swarming." The same expression might be applied with almost as much correctness to the various birds of prey that hover over its banks, far exceeding in variety of species and number of individuals any amount of the same tribes in other countries and, indeed, constituting one of the most singular features of this strange and interesting land. Vast are the flocks of geese, pelicans, storks, cranes, spoonbills, flamingoes, shags and other aquatic birds that overspread the river.—p. 105.

Cultivation of the Valley of the Nile.—The valley of the Nile is one vast uninterrupted kitchen garden, from the shores of the Mediterranean to the second cataract, a distance of a thousand miles; and, I believe, it continues to be such a garden of herbs far beyond that point into Abyssinia.—p. 108.

Birds mostly akin to English.—Very few of the birds have much beauty of colouring, and those commonly seen are either identical with or are related to the species with which we are familiar in England, such as the common sparrow, the gray wagtail, the Royston crow, the sky lark, which abounds in every field in Lower and Central Egypt, the Nile plover, very like our common peewit (also a native), turtle doves, blue rock-pigeons, besides the kestrel, hen-harrier and various other hawks identical with or closely resembling British species, as are the owl, kingfisher and many of the water fowl, some of which latter, as the flamingo, egrets, &c., are common to this country and southern Europe. Of course there are many birds exclusively African, as pelicans, paddy-birds, &c., but these are seldom distinguished by any elegance or gaiety of plumage; although, of course, there are certain exceptions to this general sobriety of colouring. As regards insects, I will only mention, that of the few butterflies that flit about the fields of this land of unclouded sunshine and high temperature, that which is by far the most frequently seen is our English painted lady (*Cynthia Cardui*), a species common with us in certain years during the latter part of summer and autumn: I have noticed as yet but a single insect of this order at all superior in size to the largest of our English Lepidoptera: the rest, few in number as regards the species, and not greatly abounding individually, do not exceed our native butterflies either in point of size or beauty of colouring; which is another proof of the position before alluded to.—P. 112.

Effects of a Scorpion Sting.—On the 21st of February our progress was delayed for some hours by an accident to our servant Ameen, who was stung in the hand by one of the great yellow African scorpions, that had been brought to me by one of the camel drivers. Ameen, foolishly relying on a supposed immunity from the venomous effect of these and other noxious animals, which he believed had been communicated to him by a serpent-charmer at Cairo, for a consideration of eleven piastres, actually grasped the scorpion with his bare hand, and it instantly struck him at the root of the second finger of the left hand. He suffered intense pain for a few hours, with a feeling of great coldness all over, numbness on the left side of the body, indistinct vision, sickness, and other constitutional symptoms of rather an alarming nature. I had none of the proper remedies with me for scorpion stings, such as ammonia and ipecacuanha, but applied laudanum to the wound, and brandy internally; the next day the symptoms had quite subsided, and Ameen felt well able to continue the journey. The scorpion was one of the largest I had ever seen, and was about five inches in length to the end of the tail.—P. 117.

Sketch of the Birds of Soudan.—When you write to H—— tell him that he would find abundant amusement in Soudan (Ethiopia Proper) amongst the innumerable multitude of birds that inhabit this region and the whole valley of the Nile; the number of individuals is perfectly astonishing, and the species themselves numerous. Birds of prey abound as in Egypt; hawks, kites, eagles, vultures, are ever seen in the air; the multitude of aquatic fowl is incredible; geese, herons, storks, cranes, spoonbills, ibises, pelicans, actually swarm, and fill the air with their myriads. Every grove resounds with the cooing of doves, of which we have killed five or six different species between Cairo and Khartoum, the species changing with the latitude. Many European genera are amongst the commonest of those inhabiting this country.

Wagtails, whitethroats, larks, plovers and sparrows are seen everywhere; in many cases apparently identical with our English species; as for instance the sky lark, common plover or lapwing, and perhaps the ordinary sparrow of the country, which comes exceedingly close to our common house sparrow, if it be not the very same bird,—being equally domestic and familiar, and even more plentiful than in Europe. In the thickets and groves along the Nile, and which here and there adorn even the desert, various richly decorated tropical birds are met with, but the ornithology of this part of Africa, like its botany, has a plain unadorned character, partaking throughout of that found to prevail in the temperate zone.—p. 126.

Hippopotami seen above Berber.—Talking of the hippopotami, we saw several when in the upper country above Berber, and in the White River, and could sometimes hear them blowing in the water at night: we never saw them on land, and could only see their broad truncated snouts, and part of their huge heads occasionally raised above the surface: they are not at the present day to be found below Berber.—p. 131

The Crocodile more fearful than formidable.—As to crocodiles, Mr. Lake, an excellent shot with his rifle, killed at least three of these monsters, on the sand-banks, but never could secure their bodies, as, on being mortally wounded, they always contrive to flounder into the water, where they either sink dead, the body not rising till after at least twenty-four hours when decomposition has begun, or they come on shore after some time to die. The crocodile is a very timid animal, and I firmly believe rarely, *if ever*, ventures to attack an adult, and then only in the water, *never* on land; but there is no doubt that they will seize children who venture into shallow water where they abound: an instance of a little girl having met with such a fate occurred at a village on our southern route, the very day before our arrival. The Arabs along the Nile never evince the least fear of crocodiles; the boatmen are constantly paddling about in the water to shove their boats off the innumerable sand-banks that obstruct the navigation in all parts of this immensely long river; and I have seen large birds strutting about almost within a foot or two of their huge jaws, as they lie basking on the banks, a dozen or more together, and have even seen them perch on the top of the crocodiles' heads. The real danger to a man, should he be able to approach so wary an animal near enough to receive injury (which could happen only in case of one disabled by a wound), would be from a stroke of his powerful tail. Their mode of gliding into the water when disturbed is by a slow motion like that of some gigantic serpent or fish; they then look very slippery, and as if all joints and suppleness.—p. 132.

The Scorpion Spider or Galleode.—At the sugar-works at Ernout, I saw one living and several dead specimens of the terrific scorpion spider or galleode of Egypt and the adjacent countries; the latter were found drowned in a large tank for supplying the engines; the former was captured in the house by Mr. Fox. The outstretched legs of the largest specimen measured about eight inches in the span. The general aspect of this hideous animal is that of a gigantic spider, which it resembles in the great length of its hairy legs the oblong livid body, jointed like that of the scorpion, is destitute of any sting, instead of which the head is furnished with a formidable pair of sharp and very prominent pincers, capable of inflicting an extremely painful though, I believe, not very venomous bite. It is a nocturnal animal, frequenting out-houses and deserted apartments, running with incredible speed, and fearlessly attacking any object that is opposed to it. Mr. Fox's Arab servant, hearing a mouse squeaking in the room one night as if in distress, was induced to ascertain the cause, when he found one of these galleodes had fastened upon it, but whether with the intention of making the mouse its prey, or from accidental offence given by the latter, Mr. Fox could not say. The natives regard its bite as not dangerous, but rather encourage it, as a noted destroyer of its first cousins, the scorpions. I have several of the above specimens (including the largest) in spirits, which I hope to send home with my plants, &c. from Alexandria.—p. 155.

Cattle of Nubia—The Water Buffalo.—In the upper countries the cattle are of a peculiar, probably distinct species of ox, very much like our own, but with a hump on the back, and the females are, as milch cows, good for nothing, being always nearly dry; so that we could scarcely ever procure cows' milk, even when meeting with large herds of them, much as we should have preferred it to that of goats. Our common breed or species is also seen in Nubia, &c., but more rarely. In most parts of Egypt, but especially in the lower provinces, the common and hump-backed cattle are in a great degree supplanted by the water buffalo (*Bos Bubalus*) a huge grotesque, ungainly, but apparently harmless and stupid animal, to which we were indebted for some of the milk obtained in Egypt, and all the abominable mass of indigestible fibres sold for beef. The water buffalo has not made its way very far beyond the second cataract, or into Nubia; but it is well known, I am told, in India. Its name is derived from its habit of laying a great part of its time immersed in the water of pools and rivers, and it is an excellent swimmer. Thousands may be seen on the banks and shallows of the Nile, during the heat of the day, luxuriously reposing, with only their heads, or even the tips of their hippopotamus-like noses visible above water: the stream that is continually passing over them brings renewed coolness with it: at times one envies them their position.—p. 176.

Serpent Charms witnessed and vindicated.—Just before quitting Cairo, on the 10th of July, I had an opportunity of witnessing the performance of the serpent-charmers who profess to clear the houses of the city of the reptiles of that order, with which they are all more or less infested. Dr. Abbot kindly allowed me to bring the men to his house, in which they captured six snakes of a harmless description in less than half-an-hour, which number included no less than three different species. These snake-charmers belong in general to a particular tribe of Arabs, who boast of having possessed their mysterious faculty for an indefinitely long period. The chief actor in this case was a fine-looking man, with a handsome and intelligent, but peculiar cast of countenance. He carried a stick in his hand, with which, on entering each apartment, he struck the walls several times, uttering, in a low measured tone, a form of exorcism in Arabic; adjuring and commanding the serpent—which he declared, immediately on the door being thrown open, was lurking in the walls or ceiling—to come forth. Presently, the reptile would be seen emerging from some hole or corner, with which every room, even in the better class of Egyptian houses, abounds; on which the enchanter would draw the unwilling serpent towards him with the point of the stick, and when within reach put it in the bag he carried about with him for that purpose. It is said that the charmer conceals one or more serpents in his ample sleeves and these he contrives to let loose in the apartment during his evolutions with the stick; such may very possibly be the case, seeing that in ordinary juggling tricks the quickest eye may be deceived by the dexterity and rapidity of the performer's movements. I can only declare that I was myself utterly unable to detect such a manœuvre as that on which the operation of charming these reptiles is said to be founded; for although the charmer did not allow the spectator to be actually in the room during the exorcism, he permitted persons to stand close behind him, whilst at the same time the door of the apartment was thrown wide open. Besides I have been assured by persons of the highest credit, that they have witnessed the feats of the serpent-charmers after their garments had been thoroughly searched for concealed serpents; that they have been made to change their clothes for others provided by the owner of the house, and, what is yet more convincing, have frequently been compelled to divest themselves of all covering before entering the room they engaged to clear. It is usual to object that, in these extreme trials, the serpents were introduced upon the premises the night previous to the experiment, by persons who usually accompany the chief performers; but it is not easy to conceive how, without some secret mode of enticing them from their lurking-places, serpents so introduced could be found and captured at the precise moment when it was desired to do so, as the nature of this class of reptiles is to ramble about in holes and obscure retreats, and to withdraw from the eye of man, rather than, like the lizard tribe, to frequent open, sunny situations where they are much exposed to view. Supposing the serpents to be introduced at the time of exorcising by the performers' attendants (which could not be done in the room in which the charmer himself exhibits, as he always enters alone, and under such rigid examination, when every precaution is taken to prevent deception, he would not be allowed to have a companion), how, I say, could the reptiles be prevented from making their escape amongst the rafters or in the holes about the apartment, which instinct would assuredly teach them to do, rather than come and present themselves to view, unless impelled to show themselves by some influence like that by which they are apparently induced to come forth from their retreats at the word of the enchanter? Were the art of serpent-charming a mere juggling deception, how could it for so many ages have been exercised as a profitable employment by a particular tribe? it being, in fact, customary in Cairo to send to the serpent-charmer when a house is much infested with serpents, just as we should require the services of a rat-catcher to rid our premises of those destructive animals. The extreme antiquity of serpent-charming is much in favour of its honesty as an art, and, were it once ascertained that conveying serpents to the premises to be cleared was a general or even frequent practice, the poor and generally covetous and parsimonious Cairenes would not give a para to have their houses stocked with noxious reptiles under the pretence of being rid of them. I certainly did not witness the exhibition under any of the above-mentioned circumstances of rigid scrutiny, but the men were taken from the street to Dr. Abott's house, without a moment's previous intimation as to whither they were about to be conducted. One or two circumstances respecting the kind of serpent brought forth, and the weak, torpid condition of the whole six, throw a shadow of suspicion on the matter, but I am not prepared to object too strongly against either of these points:

the torpidity of the reptiles might be the effect of the incantation, whatever that singular process may consist in; and although one kind was a species of slow-worm, it does not follow that, because our own indigenous reptile of that name never is found in houses, no other species of the genus can inhabit the haunts of man, as the same may be said of *all* our English serpents, which shun the abodes of mankind, whereas, in warmer climates, snakes of various and totally different genera haunt houses even in the most crowded purlieus of a great city, as at Cairo, where perhaps not a house is free from them. The serpent-charmers pretended to secure me from the accidental effect of the bite of these reptiles, by the not very pleasant process of blowing into the mouth and afterwards pressing the lobe of my left ear between the jaws of one of the snakes, so as to draw a little blood. My late experience in the case of poor Ameen's scorpion's sting in the desert did not strengthen my confidence in the charm, with which, at far less cost of money and suffering, I was fortified by the Cairene exorcist.—p. 218.

Vermin Annoyances.—There being no bedstead in the room, the mattrass was spread on the floor, which I speedily discovered to be peopled by innumerable hosts of fleas, bugs, ants and cockroaches, whilst, from the time the sun went down, there was neither peace nor quiet to be had, when sitting up, and endeavouring to read or write, from the incessant attacks of mosquitoes, which sang their shrill, small war-notes in my ears without a moment's respite, inflicting punctures on the back of my hands the instant I relaxed in my efforts to drive them away; from these to me far the most annoying of all insect-tormentors I could defend myself during the night by retiring into my fortress of muslin, as Saad and myself contrived to suspend mosquito-curtains very cleverly over the bedding beneath, by means of strings made fast to nails driven into the walls of the room, and tied to the window-bars; but this was no barrier to the other insect-annoyances, with the exception of the cockroaches, which it effectually kept out, as also a gigantic species of mouse, which replaces in Egypt the common European kind: it is almost the size of a small rat, the body very long and the ears extremely large and round.—p. 227.

Swimming Snake.—I witnessed to-day a singular attempt of a large snake to make his way against the current of the Nile: after persevering for about a quarter of an hour to stem the stream, he, with the wisdom of his race, yielded to the force of circumstances, and turning his head in the contrary direction, was carried, without effort on his part, towards the Mediterranean, in which quarter, it is probable, whatever affairs had called him abroad would be as well transacted.—P. 225.

Extracts from the Correspondence of HENRY BIRCHALL, Esq., *while in South America.*[*]

Santa Marta, New Grenada, July 9, 1856.—All around the north-east side of the town a cactus-swamp extends, and then a sort of waste plantation, through which paths run, goes round to the southern side: the cactus trees are from twenty to thirty feet high, and their prickles are fearful, making nothing of a boot-leather. In this plantation I have had some excellent entomologizing: butterflies were in prodigious numbers, but so extremely active that they were hard to catch beyond belief; I, however, succeeded in capturing thirty species, besides some Coleoptera and dragonflies. There is no grass anywhere; the ground is covered with a sort of shrubby, bilberry-like plant, under which myriads of blue, green and yellow lizards find shelter. The profusion of butterflies is something quite astonishing, but they fly so fiercely that they are soon injured, and perfect specimens are the exception. It is only possible to collect for about two hours, from 7 to 9 A. M., the heat is so great. I knocked down with my towel yesterday a beautiful swallow-tail *(Papilio Epidaus)*. Almost all the shrubs and trees are garnished with most villanous thorns, so one has to be on one's guard in rushing through the bushes after game, and many a fine insect has escaped from my net becoming caught in the thorns. The butterflies seem to me to take five times as much killing as our English ones; no amount of nip appears to floor the larger species, and I have no chemicals at hand for them. In the bush there are lots of our familiar green-house plants,—Mimosas, Daturas, Bigonias; the mango trees are something like walnuts, with a touch of yew about them, and the fruit in great abundance, but I dare not touch it.

Barranquilla, July 13.—On my road here the butterflies fairly drove me distracted, for I could not catch them with my spurs on: this afternoon I have taken a walk, and persecuted them a little, but with only middling success; in fact, I found two could play at that game, and I got the worst of it, and had to procure some hartshorn as a remedy for my persecutors' bites. On my return I found the saloon in a commotion, on the discovery of a large scorpion; I immediately got out my bottle, and, after some manœuvring, persuaded him into it by means of a paper-knife: they are horrid-looking wretches, and worse than they look, by all accounts; their sting is said to be fever to a certainty: this fellow is nearly six inches long. The natives say scorpions are always in pairs, and as soon as one is found look about for his companion, but we could not find the second this time.

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[*] Communicated by Edwin Birchall, Esq.

July 22.—On board the "General Mosquera" steamer on the Magdalena: getting up at 5 A. M. saw the magnificent range of the Sierra Nevada of Santa Marta under the eastern sky: this range is from sixty to seventy miles distant, and yet looked quite near; but the clouds of the horizon ran along between us and their base, showing their enormous altitude,—17,000 to 18,000 feet is about the highest; during the day they are quite invisible from Barranquilla. The Magdalena here is perhaps three-quarters of a mile wide, and the current runs three miles an hour; the waters are as yellow and muddy as those of Father Tiber, and so continue upwards. Enormous quantities of a weed called "batate" encumber the waters; in appearance it is like the Lotus, and the lagoons are almost choked with it: it floats down chiefly from the Cauca river. This evening, the ship being heated by the sun, and kept hot by the great boilers, felt like a baker's oven: I went aft to a cooler corner, though it was very damp, and watched the brilliant sparkle of the myriads of fireflies in the forest; they are most charming in their brightness. I know not how to describe the beauty and novelty of the scene through which I have been passing: trailing plants, in long festoons, hang in all directions; sometimes a score of trees are grown into one tangled mass of creepers, with hollows underneath, like wilfully contrived pleached alleys and secret arbours; birds in orange and blue, gold and crimson, green and purple, and every other possible combination, flit in and out as we go by, hugging the bank; now and then a great alligator, stimulated by a rifle-bullet, splashes from the bank into the muddy water, and disappears below; here a brace of white herons are watching for fish; gaudy kingfishers dash into the water and out again; huge macaws, in blue and yellow, sail clumsily and scream as they go; over the tree-tops great hawks wheel round and round; everywhere the hum of insects and the fluttering of butterflies,—all speak of the universality of life, and say to man that he is not the sole object of the world's existence and its Maker's care. The scenery is more like Windermere or the lower Lake of Killarney than anything else I can think of; islands without number, but so large as only to look like corners where another river comes in; we don't see them as islands, but are constantly branching off right or left to go past them. At 9 A. M. arrived at Pinto, a wood station, where, as three hours stoppage was necessary, I went ashore to persecute my old friends: the abundance of one beautiful crimson and black butterfly (Vanessa Amalthæa) was quite embarrassing. It was pretty hot, but not oppressively so.

July 23. Mompos.—Arrived at 3.30 P. M., and found the heat tremendous. Mompos is built along the river, by which runs a terrace shaded by enormous trees, but shade is hot here as well as sunshine: a fine church, half built and wholly overgrown with creepers, shows the decadence of the place since the days of the Spanish *régime*, but large fairs are held here, and much business for the interior transacted. After being bored till near sunset I escaped from my Yankee friends to have a look after my game; however, I went along the river-bank among the thick growth of plantains (*Musa*), and was rewarded by the capture of several magnificent fellows, six inches across the wings (Pavonia Ajax); I saw one in the cathedral at Santa Marta, but could not catch it, having only my hat. In the evening swarms of moths came on board, and I captured many; one in particular, a huge purple-brown fellow, with eyes in the under wings, is a capital-looking subject, but being fat-bodied he is not for dying.

July 23. 12.45.—Arrived at Banco, another wood station; went ashore of course with net, and straight into the forest, 100 yards from the vessel, and had pleasant doings with my friends the butterflies, who were numerous, but desperately lively; nevertheless I overcame many, and added fifteen species to my stock in the course of an hour. I find that having a pursuit is essentially serviceable; nothing can be more wearisome than life in a steamer like this, where every action is in public, from getting out of bed to getting into the same: no bathing to be had, which makes very uncomfortable mornings; dare not try the river, the alligators lying in every sand-bank—the ugly villains.

July 26.—My perseverance has infected my American friend Mr. F———, who has got me to rig a net for him: he says his sisters will go crazy, he "guesses," when he brings them a lot of these butterflies; he also "guesses" that whoever I am collecting for will "go crazy" on seeing my "assortment."

July 30.—Saw troops of big brown monkeys jumping one after the other along the tree-tops, swinging by their tails for an impetus when the leap was rather a stiff one: I heard them roaring in the forest today, where we wooded, just like tigers, but being aware of their practices I did not look out for "fur and claws." This evening the chain of mountains beyond, and among which Bogotá lies, came into view towards the south-west; they look very magnificent, but no snowy peaks in sight. I saw the "Southern Cross" last night for the first time: why anybody took the trouble to give it so foolish a name I cannot imagine; the "Southern Rhomboid" would be nearer the mark, besides it is not conspicuous: take the four stars of the square of the Great Bear and diminish their brightness considerably, and you have the constellation so much talked of: the great beauty of the southern heavens lies in the region of the Milky Way, which is a perfect blaze of stars.

Honda, August 5.—The town is beautifully situated, surrounded by mountains of moderate elevation, with a loud, brawling stream of pure water rushing through it and joining the Magdalena close to the town; the river is called the Gualí, and much resembles the Wharfe; Ilkley gives a fair idea of Honda in general position, and the architecture has also a certain resemblance, many houses being thatched and others covered with badly-made red tiles.

August 6.—Rode to the mines of Santa Ana in about five hours; most of the road lies across a grassy plain, bordered by walls of mountains in extraordinary forms, and presenting many splendid views: the heat on these plateaus is very oppressive, but we descended now and then into the "quibrada" or ravine of a torrent, where trees shaded us, and we were refreshed. For the last two hours we were ascending the side of a steep mountain, but our fatigue was repaid by glorious views of the valley below; the sun set in the valley long before we reached our journey's end, and we thus obtained a very beautiful effect of light and shade, such as I never saw before: rising on the other side of the valley was a cliff some 400 feet high, which, however, from our elevation, and backed by the immense mass of the "Paramo," or range of Bogotá, seemed inconsiderable, and only like a great castle commanding the valley; when darkness had set in below, a ray of sunshine through the clouds struck on this castellated cliff, lighting it up with red and gold, whilst perpendicularly from its summit rose a broad stripe of rainbow, being the lower arc of a very large one, the rest of which was invisible; the piece of rainbow appeared nearly straight, and looked like a pillar of coloured fire rising above the illumined castle: even our American was enraptured with the spectacle. The Andes look magnificent from this point: the eastern range, on which is Bogotá, stretches, like a mighty wall, beyond the valley, and we can see with a glass the trees and a house where the plateau of Bogotá begins, and past which I have to travel; the height looks prodigious, and the confused mass of mountains between that point and this tells what a road we have to take. On the opposite horizon the sun-covered central range ought to be visible, but clouds concealed it during my stay.

August 12.—My luggage arrived yesterday; the ants have made sad havoc amongst the butterflies, eating their heads and bodies lamentably, although shut up in a writing-case in my carpet-bag; the bulk are, however, safe, having been placed in a light box impregnated with petroline.

Bogotá, August 28.—The first few miles out of Honda are really awful for one unaccustomed to these roads; the slopes we had to ascend and descend looked almost perpendicular; some of them were just like going down the outside of the dome of St. Paul's, where a slip of the animal could send you further than was amusing, whilst the ascents were done by fair scrambling up of the mules, during which it was hard to avoid slipping off over the tail; nevertheless an hour or two makes you regard all this with perfect indifference, so steady are the mules. As we rode along, gradually ascending, we obtained magnificent views of the valley of the Magdalena, with the broad river winding through perpendicular cliffs, beyond the range of the Andes, and far away over them, towering at a height inconceivable, the snowy peak of Tolima, one of the central range, conical and massive, far above the clouds that floated along the sides of the lower mountains. Higher and higher as we wound through the mountain-passes, amid woods and torrent-beds, the views of the lower country became more and more splendid; mountains, which from Honda looked important, sank down to a mere portion of the wild confusion of hills below us: if the bottom of the Wharfe, from Bardentown to Bolton Abbey, were dry, and you had to ride from the latter to the former along the river-bed, you would be doing what there is any quantity of between here and Honda; you have to clamber up places jump by jump, which is bad enough, but more agreeable than going down smooth places like the outside of a monstrous stone loaf, and this, you will please to observe, is the high road between the capital of New Grenada and its principal sea-port. The plain of Bogotá, situated 10,000 feet above the level of the sea, seems of enormous extent, and is bounded on every side by ranges of mountains of moderate height; westward, over the nearer hills, Tolima, with his snowy head and a long range near him are visible in the morning. The plain is rather swampy; I noticed the beautiful little Colias Dimera flying in great numbers, and settling in damp spots in the road. In dry weather you have as good a road to canter on as there is in England, but in wet—I won't say—it must be fearful, judging by a place or two where rain had fallen in the night. I am most fortunate to come up in the dry season, for the road from Honda is quite another business after a fortnight's rain; man and beast get bogged up to the neck, and every place is disgustingly shaky and slippery. I forgot to say, when at the mines of Santa Ana, I captured some magnificent and monstrous butterflies, six inches from tip to tip (Morpho Adonis and M. Cytheris); I do not know which to admire the most, the brilliant metallic blue of the former or the perfect resemblance of the latter to the glittering, flickering flashes of the opal: here they are much in request for drawing-room ornaments. One thing we have here, the infinite beauty and glory of which never satiates nor repeats itself—the wondrous sunsets, which lately have been of singular splendour: a few evenings ago we had one I never saw equalled; the cool, deep blue of the East was set off with fine white clouds tinted with pink, and then to the zenith gradually changing to a deep gray; descending westward this formed a mighty arch from south to north, perhaps thirty degrees high at the centre, fringed with delicate red and flecked with patches of the same colour; the open arch itself was like the very portal of paradise, all clear, pure white silver, of dazzling brilliancy, whence came light, which, thrown on the warm reddish yellow of the cathedral, combined so as to give it the most intense pure lemon-colour, standing in magic contrast against the deep blue and purple-brown mountains behind. The silver archway was groined with delicate lines of crimson, looking like the tracings of the mason-work; right and left were golden clouds as door-posts; below, all the buildings and the hills which bound the plain were in darkness, with only here and there a turret sharply defined against the silver brightness; watching awhile its beauty from the "Altozano," or terrace in front of the cathedral, gradually the colours changed, less bright perhaps, but, from the increasing darkness below, this was not sensible; the silver gradually changed to gold, the gray to greenish brown, whilst an intensely bright flame-colour marked the place of the sun's disappearance; so the changes went on without visible alteration of form, through all the combinations of the rainbow, until all was gone. Perhaps the sunset here is not so very much more beautiful than in Europe; it may be, as I always walk on the Altozano or to the suburbs about that time, that I take more notice, but it seems to me that the colours are more vivid than they are in England. The most striking thing, perhaps, about these glorious sunsets is that it is absolutely dark on the ground whilst all this wondrous play of light and colour goes on in the west; you can see nothing of the details of the houses between you and the western sky, nor could you recognize any one a few paces distant.

(To be continued.)

Extracts from a Letter of Mr. A. R. Wallace *to* Mr. S. Stevens.

Ternate, September 2, 1858.—When I arrived here from New Guinea, about a fortnight ago, I found your two letters of January and March, noting the safe arrival of the Aru collections and the advantageous disposal of the birds: they gave me the greatest pleasure and satisfaction, and the interest the collections appear to have excited was a great encouragement to me; and I assure you I stood in need of some encouragement, for never have I made a voyage so disagreeable, expensive and unsatisfactory as the one now completed. I suffered greatly from illness and bad or insufficient food, and am only now just sufficiently recovered to work hard at cleaning and packing my collections: my servants suffered as much as myself; two or three were always sick, and one of my hunters died of dysentery. My collections will greatly disappoint you and my other friends,—more than they do myself,—because you will be expecting something superior to Aru, whereas they are very inferior in fine things. First and foremost, all my hopes of getting the rare paradise birds have vanished, for not only could I get none myself, but could not even purchase a single native skin! and that in Dorey, where Lesson purchased abundance of almost all the species: he must have been there at a lucky time, when there was an accumulated stock, and I at a most unpropitious one. It is certain, however, that all but the two common yellow species are very rare, even in the places where the natives get them, for you may see hundreds of the common species to perhaps *one* of either of the rarer sorts. There are some eight or ten places where most of the birds are got, and from each I doubt if there is more on the average than one specimen per annum of any other than the Paradisea papuana; so that a person might be several years in the country, and yet not get half the species even from the natives: yet they are all common in Europe! I sent two of my servants with seven natives a voyage of one hundred miles to the most celebrated place for birds (Amberbaki, mentioned by Lesson), and after twenty days they brought me back nothing but two specimens of P. papuana and one of P. regia:

they went two days' journey into the interior without reaching the place where the birds are actually obtained; this was reported to be much further, over two more ranges of mountains. The skins pass from village to village till they reach the coast, where the Dorey men buy them and sell to any trading vessels. Not one of the birds Lesson bought at Dorey was killed there; they came from a circuit of two hundred or three hundred miles. My only hope lies now in Waigiou, where I shall probably go next year, and try for P. rubra and P. superba. Even of P. papuana I have not got many, as my boys had to shoot them all themselves; I got nothing from the natives at Dorey. You will ask why I did not try somewhere else when I found Dorey so bad: the simple answer is, that on the whole mainland of New Guinea there is no other place where my life would be safe a week: it is a horribly wild country; you have no idea of the difficulties in the way of a single person doing anything in it. There are a few good birds at Dorey, but full half the species are the same as at Aru, and there is much less variety! My best things are some new and rare lories.

In insects, again, you will be astonished at the mingled poverty and riches: butterflies are very scarce; scarcely any Lycenidæ or Pieridæ, and most of the larger things the same as at Aru. Of the Ornithoptera I could not get a single male at Dorey, and only two or three females; I got two from Amberbaki and two from the south coast of New Guinea, from the Dutch exploring ship. Of Coleoptera I have taken twice as many species as at Aru; in fact, I have never got so many species in the same time; yet there is hardly anything fine: no Lomopteræ,—in fact, not one duplicate Cetonia of any kind, and only two solitary specimens of common small species! No Lucani! perhaps nowhere in the world are Lamellicornes so scarce,—only fourteen out of 1040 Coleoptera, and most of them small and unique specimens. Of Longicornes there are full as many as at Aru; many the same, but a good number of new and interesting species. Curculionidæ very rich; some remarkable things, and the beautiful Eupholus Schœnherri and E. Cuvieri; the former rather abundant. There is a very pretty lot of Cicindelidæ; two Cicindelas and three Therates will probably be new to the English collections; they are C. funerata, *Bois.*, a very pretty species, with a peculiar aspect; C. d'Urvillei; also a small new species, near C. funerata, very scarce. Therates basalis, *Dej.*, a very pretty species, I have sent a good many of; T. festiva, *Dup.* (I think), a pretty brilliant little species, not common, and another of the same size, and, I think, quite new, rufous and black marked, also scarce; T. labiata and Tricondyla aptera are the same as sent from Aru. I have never before found so many species of Therates in one place: they form quite a feature in the Entomology of Dorey. Carabidæ were very scarce: I picked up, however, some pretty things, especially two most brilliant Catascopi, but both unique. For a long time I took no Staphylinidæ: at last I found a station for them, and by working it assiduously I got between eighty or ninety species: some are the handsomest of the group I have yet taken, and there are many curious and interesting forms. Talk about Brachelytra being rare in the tropics! of their place being supplied by ants, &c., &c.! why, they are absolutely far more abundant in the tropics than anywhere else, and I believe also more abundant in proportion to the other families. I see in the 'Zoologist' two local lists of Coleoptera (Dublin and Alverstoke), in which the numbers of Staphylini are 103 and 106 species respectively; these are the results of many years collecting by several persons, and in a country where all the haunts and habits of the tribe are known; here, in two localities (Macassar and Dorey), I have taken at each nearly the same number of species, in three months' collecting, on a chance discovery of one or two stations for them, and while fully occupied with extensive collections of all orders of insects, in a country where every other one is new. The fair inference is, that in either of these localities Staphylini are really ten times as numerous as in England; and there is reason to believe that any place in the tropics will give the same results, since in the little rocky island of Hong-Kong Mr. Bowring has found nearly 100 species; yet Dr. Horsfield, who is said to have collected assiduously in Java, did not get a solitary species. My next richest and most interesting group is that of the Cleridæ, of which I have about fifty species, perhaps more, for they are very puzzling: I have never got so many in one locality, nor should I now had I not carefully set them out and studied their specific characters, and thus separated many which would otherwise certainly have escaped notice. In another small and obscure group, the Bostrichidæ and allied Scolytidæ, I obtained no fewer than thirty-eight species, whilst the Lampyridæ and allied groups were in endless and most puzzling variety. I have also got an exceedingly rich and interesting series of Galerucidæ and Chrysomelidæ. The Elaters are small and little interesting. The Buprestidæ also are very inferior, and of the only fine species (*Chrysodema Lotinii*) I could only obtain a single pair. With so many minute Coleoptera I could not give much attention to the other orders; there are, however, some singular Orthoptera, and among the Diptera a most extraordinary new genus, the males of which are horned; I have three species, in two of which the horns are dilated and coloured, in the other long, slender and branched; I think this will prove one of the most interesting things in my collection. One would have thought Dorey would have been just the place for land shells, but none were to be found, and the natives hardly seemed aware of the existence of such things; I have not half-a-dozen specimens in all. Although Dorey is a miserable locality,—the low ground is all mud and swamp, the hill very steep and rugged, and there are only one or two small overgrown paths for a short distance, my excursions were almost entirely confined to an area of about a square mile,—yet the riches in species of Coleoptera, and a considerable number of fine remarkable forms of which I could obtain only unique examples, sufficiently show what a glorious country New Guinea would prove if we could visit the interior, or even collect at some good localities near the Coast.

You ask me if I go out to collect at night; certainly not, and I am pretty sure nothing could be got by it: many insects certainly fly at night, but that is the reason why they are best caught in the day in their haunts, or else by being attracted to a light in the house. Besides a man who works, with hardly half an hour's intermission, from 6 A.M. till 6 P.M., four or five of the hottest hours being spent entirely out of doors, is very glad to spend his evenings with a book (if he has one) and a cup of coffee, and be in bed soon after 8 o'clock. Night work may be very well for amateurs, but not for the man who works twelve hours every day at his collection.

I am perfectly astonished at not yet meeting with a single Paussus; Several are known from the Archipelago, and have been taken in houses and at light, yet my four years look-out has not produced one. How very scarce they must be! You and Dr. Gray seem to imagine that I neglect the mammals, or I should send more specimens, but you do not know how difficult it is to get them: at Dorey I could not get a single specimen, though the curious tree-kangaroos are found there, but very rare: the only animal ever seen by us was the wild pig. The Dutch surveying steamer bought two kangaroos at Dorey whilst I was there: it lay there a month waiting for coal, and during that time I could get nothing, everything being taken to the steamer. I send from Dorey a number of females and young males of Paradisea papuana; these females have been hitherto erroneously ascribed to P. apoda, of which I am now convinced my specimen from Aru is an adult female; it is totally brown: the females of P. papuana are smaller than the young males, and have the under parts of a less pure white: the bird figured by Levaillant as the female of P. papuana is a male of the second year which has acquired the green throat in front, but not the long feathers of the tail or flanks: to all the female specimens I have attached tickets,—all not ticketed are males.

Whilst the Dutch steamer was at Dorey a native prow came from the Island of Jobie, and bought two specimens of Atrapia nigra, which were sold to a German gentlemen, who is an ornithologist, before I knew any thing of them: I believe that island is their only locality, and the natives are there very bad, treacherous and savage. That is also the country of the rare species of crown pigeon (*Goura Victoriæ*); a living specimen of this was also purchased on board the steamer. I have great thoughts, notwithstanding my horror of boat work at sea (for a burnt child dreads the fire) and my vow never to buy a boat again, of getting up a small craft and thoroughly exploring the coasts and islands of the Northern Moluccas, and to Waigiou, &c.; it is the only way of visiting many most interesting places,—the Eastern coast of the four peninsulars of Gilolo, the Island of Guebe, half-way between Gilolo and Waigiou, a most interesting spot, as Gilolo and Waigiou possess quite distinct Faunas.

A. R. Wallace.

Extract from a letter of M. Mouhot *to* Mr. S. Stevens.

Bankok, October 13, 1858.—I have had great difficulty in procuring the few specimens I now send you, as I arrived here just at the end of the rainy season, when the country was completely inundated; besides this, my first and charming collection of beautiful insects was devoured by ants, which swarm here in an extraordinary manner; in the space of one night they destroyed about sixty Lepidoptera, with about one hundred Neuroptera, Hemiptera, &c.; in the morning nothing remained of them but shapeless atoms. In vain I employed the most efficacious means to get rid of them, and such as had hitherto always succeeded; oil Bombay or the Siam wood-oil alone was effectual. During sixteen days that my boxes were oiled the ants kept away from them, and it is no longer necessary to have recourse to suspended planks or to place the feet of the table in basins of water. I consider this an important discovery,—the more so, as none of the inhabitants of Bankok, who have their magazines frequently ravaged by these destructive insects, could inform me of a remedy.

Siam is a terrible country to explore; there are no other means of communication than by water or on elephants; I have therefore purchased a boat and engaged rowers, who have consented to follow me.

The country is certainly most interesting and beautiful, and if I am spared to return to Europe I hardly know how I shall like our cold, dull and rainy seasons, our pale sun and our stunted vegetation: I shall live in the memory of all that is most beautiful in Nature. How pleasant it is to awaken to see the brilliant sun, to hear the thousand sounds, the humming of insects and the noise of other beings: no repose here. Always and everywhere an extraordinary vitality.

I am more than surprised here at seeing little children of two and three years of age towing barks of large size on the deep, rapid river; they swim like fish, and are exceedingly intelligent and precocious; for a small piece of cigar or tobacco they will run after butterflies and render me a thousand little services; whilst my great idle domestics, on the contrary, sleep a great part of their time with a cigar behind each ear and a third in the mouth. My little companions are ready to help me everywhere.

I have found here a kind of spider which produces silk; she allows herself to be milked or drawn, one may say, for you have only to take a card and wind the silk, which comes from her abundantly: it is very strong and very elastic.

How happy people may be in this country! Nature is so lavish of her bounties; excellent vegetables are found upon the trees, and roots of the bamboo and others; in the woods exquisite fruits, and the rivers overflow with fish.

November 4, 1858.—To day I have caught about twenty butterflies, killed two owls, a cuckoo (quite black) and the most beautiful dove I have ever seen, with green wings and a yellow head,—a very great beauty.

Notice of the Various Species of Bovine Animals. By the Editor of the 'Indian Field.'

(Continued from p. 6367.)

THE second group of taurines is exemplified by the domestic cattle of Europe or ordinary humpless cattle. Their horns, as in the bisontines and also the humped taurines, are cylindrical;* whereas in all that follow the horns are much flattened; and the *typical* flexure of the horns is first outward, then forward at about a right angle with the line of visage, and finally upward and in some inward at the tip. In all other Bovinæ, without exception, the horns do not *typically* curve forward beyond the plane of the face (a line drawn from the forehead or crest of vertex to the nose), but just attain to that plane, and mostly incline backward at the tips. Abnormally curved horns are very common in the humped cattle, but if they turn forward beyond the plane of the visage, the flexure passes downward and inward; as shown among other instances, by the hugely thick horns of the Bornouese cattle of Denham. The typical curvature of horn of the humped cattle is similar in direction to that of a yak's horn (only laterally more oblique in the set); or as shown by the immense head-gear of the African Galla cattle.* That of the humpless taurines now treated of may be familiarly exemplified by the horns of our British Devon cattle, the so-called wild cattle of Chillingham Park, and equally so by those of the fossil Bos primogenius, Bos namadicus, and others.† Various abnormal forms of horn occur in the domestic breeds of European cattle, but these do not resemble the abnormal forms of horn of the humped cattle; and, to our apprehension, the mere typical or normal flexure of the horn of the "zebu" or humped cattle (as will be obvious on a little study of the subject) resembling that of the yak's horns as before remarked, and more or less all the rest of the tribe, as opposed to the group of *humpless taurines with cylindrical horns*, is sufficient evidence of the specifical distinctness of the humped races. We might have added the configuration and physiognomy of the skull to the other distinctions, the specifical difference being here also well marked.

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* There is a considerable tendency to a flattened form in the horns even of many humped cattle.

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* In the small Bengali race of cattle there is a decided exceptional tendency, at variance with the other races of humped cattle. The horns mostly incline forward at a considerable angle with the plane of visage, as remarked by Buchanan Hamilton, when noticing the contrary in the different races observed by him in Southern India; but they have an abnormal look, and very commonly curve downward and even inward at the tips, as mentioned above. Indeed, not unfrequently the prolongation of the growth would cause the tips of the horns to enter the orbits and so destroy the eyes, if those tips were not sawn off in time to prevent such injury! This, therefore, must necessarily be an *abnormal* curvature!

† The Devon and Spanish cattle quite come up to our notion of a typical form of the conventional or artificial species yclept Bos taurus. Why we call it so will appear in the sequel. The Herefords are the same thing magnified and coarser. The Alderneys smaller and still neater. We confess, too, a considerable admiration of the little shaggy Highland cattle, so artistically pourtrayed by the pencil of Rosa Bonheur.

As with the humped cattle, the living races of the humpless with cylindrical horns have the latter thicker and shorter in the bull, longer and more slender in the ox and cow ; but it does not appear that this rule held with the more ancient of two races currently assigned to Bos primogenius. This more ancient race, which was contemporaneous with the long-horned form of bison (*B. priscus*), the Elephas priscus, &c., had horns which were both longer and thicker, *i.e.* every way larger in the bull than in the cow, and we have measured a pair (the largest of several examined), the *bony cores* of which were 3 feet long and 19 inches round at base.* In this type the horns tend to approximate towards their tips,—not so in the other. The skull too is smaller, notwithstanding the huge magnitude of the horn-cores. In the other, or less ancient of the two races, apparently, the remains of which are found chiefly in peat-bogs, instead of the older clays and gravel-drift which contain the bones of the former, the horns (as in our modern cattle) were comparatively thick and short in the bull, longer and more slender in the cow.—*Vide* Nilsson's figures of a bull-skull in the 'Annals and Magazine of Natural History," 2nd series, vol. iv. pp. 257, 259, and Professor Owen's figures of a cow-skull in his 'History of British Fossil Mammals and Birds,' pp. 498, 507. This race we take to be the true urus of Cæsar and other Roman writers (ure-ox, uhr-ox, aurochs, as variously written, which last has been transferred in Germany to the bison, as in modern times it is applied to the Cape buffalo by the Dutch colonists of South Africa),—a gigantic animal, which lived down to comparatively modern times, and of which Mr. Woods, as quoted by Professor Owen, cites the discovery of a skull and horns in a tumulus of the Wiltshire downs, as "evidence that a very large race of genuine taurine oxen originally existed in this country (England), although most probably entirely destroyed before the Invasion of Britain by Cæsar, since they are not mentioned as natives of Britain by him."† In all other bovines, the horns are both longer and thicker in the male sex,—the only exception (in the former respect) that occurs, being the Indian buffalo in some instances.

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* Another of the same linear dimensions, but eighteen inches in circumference at base, is noticed in the 'Annals and Magazine of Natural History,' vol. ii. p. 163 (1838).

† It surely does not follow, that even great Cæsar himself should know the animals of the country by intuition ! Our countrymen were long enough in India before they discovered the Gaour ! What, too, about the former tradition of the dun cow of Guy, Earl of Warwick ? One of the oldest known sub-fossil skulls of the giant ox is, we believe, still exhibited in Warwick Castle : and the tradition may have reference to it and be purely imaginary.

Another particular in which the humped and round-horned humpless races agree, while differing from all the rest, is in the greater length of tail, which, with its tuft, descends considerably below the hocks; the short-horned Italian race of buffalos alone approximating them in this respect.

At the present epoch, no cylindrical-horned humpless taurines are known for certain in an aboriginally wild state, though immense herds have gone wild in the pampas of South America, and there are many in the Falkland Islands, which have been finely described by Darwin, and more recently in the narrative of Sir James Ross's Antarctic Expedition. These are of Spanish descent, and therefore akin to our British Devons.—(*Vide* Jacobs 'Travels in Spain,' p. 154). Wild cattle of some sort, however, quite possibly aboriginal, inhabited the British forests during the middle ages, and likewise the great forest of the Ardennes,* and in the Vosgian mountains, as mentioned by various writers; FitzStephen, for example, notices the Uri Sylvestres, which, in his time, that is about 1150, infested the great forests round London. In the Nineveh representations the hunting of the wild bull is often depicted, and would appear to have been a favourite pastime of the ancient monarchs; and the animal would seem to have been a humpless taurine of the present group, but nothing whatever is known of it beyond what the Nineveh figures supply. "Wild cattle" are often noticed by travellers in North Africa; but the Bubalis (a species of "Harte-beest"*) is generally intended, and sometimes even the Leucoryx or white oryx; while the gnoos are the "wilde beests" (*i.e.* wild cattle) of the Dutch colonists of South Africa, who again call the hippopotamus the "sea cow," a name elsewhere applied to the Manati. The wild cattle of Madagascar we know nothing about, except that they are stated to be humpless, and longer in the legs than European cattle; † and the fine South-African domestic Caffre cattle are of the present group of taurines, though not introduced by Europeans; a fact all the more remarkable, as we know only of humped domestic races in all middle Africa and in Madagascar; but we have seen part of a fossil skull, with the particular flexure of horn, from the neighbourhood of the Gariep or Orange River. ‡ The horns of the Caffre cattle extend out excessively, almost in a line with each other,

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* The latter, however, were perhaps bisons. Dr. Weissenborn (who so ably argues for the identity of the urus and bison, despite the evidence afforded by sub-fossil remains) quotes the work of a monk of St. Gallen, who describes a hunting party of Carolus Magnus, which was held in honour of the Persian Ambassadors, not far from Aachen (Aix la Chapelle), probably in the Ardennes, in order to kill "uri or bisons;" and of one wounded by Carolus Magnus and killed by Isambardus, which he calls "bison vel urus," mentions that its horns were of an enormous size ("immanissimis cornibus in testimonium prolatis"), which should rather indicate the urus; but we have the testimony of Herberstein regarding a bison, "within whose horns three stout men could sit." A peat-bog skull of the Bison priscus type, of the age of the later uri so often met with, would serve alike to corroborate Herberstein's statement, and to help to identify the Bison priscus with the modern bison—or, better, as regards the latter, gradations of form in the intermediate period. It seems clear that the ecclesiastic cited did not distinguish between the bison and urus, which may indicate that the latter had already been long extirpated in his vicinity, and the name only vaguely preserved at the time he wrote. Of the so-called "wild cattle" preserved in certain British parks, the white colour is alone strong evidence of their former domesticity. Any cattle preserved as they are would become similarly wild in the course of a few generations. A recent writer describes those in Cadzow Park, belonging to the Duke of Hamilton, to be "about the size of our modern bullocks, but differing from them in their extraordinary breadth of chest and strength of forearm. They are of a creamy white, the ears, muzzle, and tips of horns being jet black. The old bulls have a shaggy mane a few inches in length. They have the range of an extensive park, the remains of an ancient oak-forest, through which they roam unmolested; they thus retain many of their normal habits and much of their original ferocity. When a calf is born it is carefully concealed by its mother, and if any one is so rash as to approach it the whole herd rush to the rescue, when most people think it safest to retreat. The old bulls in particular are very savage. A few years ago Mr. Minto, head-keeper to the Duke of Hamilton, while riding through the park was charged by one; his horse was thrown to the ground and severely gored

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in the flank, but gaining its feet it galloped off, followed by the infuriated animal, so affording its rider an opportunity of effecting his escape. I believe that the Dukes of Hamilton are bound by an old charter to preserve the breed, and great attention is now being paid to prevent the race degenerating."—*Field*.

* We have seen what appear to be two distinct species of Bubalis from North Africa, one as big as the South African Caama or "Harte-beest," with black feet; the other considerably smaller, with feet coloured like the body. A third from Tunis is mentioned by Dr. J. E. Gray, as being probably distinct, with a dark brown streak on the outer side of the front of the fore legs, as in the Cape "Harte-beest." Some notice of the herds of Bubalis will be found in Barth's recent 'Travels.'

† Flacourt: we were wrong in terming this, the boury, which name refers, according to this author, to a large race of domestic humped cattle common in the island. "Horned cattle are numerous, both tame and wild: many of the latter resemble, in shape and size, the cattle of Europe."—*Ellis's History of Madagascar*.

‡ Perhaps of the same species as the enormous fossil noticed in the 'Proceedings of the Geological Society' for 1840, p. 152:—"Cores and portions of an ox in the alluvial banks of the Moddea, one of the tributaries of the Gariep or Orange River, and forty feet below the surface of the ground. The cores, with the breadth of forehead, measured 11 feet 7 inches, but it is calculated that 5 inches had been broken off at the end of each tip, and circumference of piths at base was 18 inches. The orbits were situate immediately under the base of the horns." The only wild bovine at present existing in South Africa is the Cape buffalo.

but what flexure remains is nevertheless sufficiently typical.* Again, the Indian fossil Bos namadicus, from the Nerbudda deposits, is surprisingly like the European B. urus or B. primogenius ;† and we have much reason to suspect that an existent species of the same group, with cylindrical horns, inhabits certain of the forests of Indo-China, in addition to the different flat-horned taurines to be noticed in due course.

The un-named species referred to is probably that mentioned by Crawfurd in the following passage :—" The ox is found wild in the Siamese forests, and exists very generally in the domestic state, particularly in the southern provinces. Those we saw about the capital were short-limbed, compactly made, and often without horns, being never of the white or gray colour so prevalent among the cattle of Hindustan. They also want the hump on the shoulders which characterizes the latter. They are used only in agricultural labour, for their milk is too trifling in quantity to be useful, and the slaughter of them, publicly at least, is forbidden even to strangers. Hence, during our stay, our servants were obliged to go three or four miles out of town, and to slaughter the animals at night. The wild cattle, for the protection of religion does not extend to them, are shot by professed hunters, on account of their hides, horns, bones and flesh, which last, after being converted into jerked beef, forms an article of commerce with China."—'Mission to Siam and Cochin China,' p. 430. It is probable that different species of wild cattle are here referred to, including one or more of those with flattened horns. The Rev. J. Mason, in his 'Notes on the Fauna, Flora, &c., of the Tenasserim Provinces' (1852), remarks that "a small ox from the Shan country is brought down sometimes in considerable numbers, which resembles in its form the English rather than the Indian ox, but is probably derived from the wild race. Occasionally a young wild ox is domesticated, and brought under the yoke." By the latter, we suspect he means the tsain, a flat-horned species akin to the banteng; and by the former the indigenous round-horned species before referred to. It is to be regretted that the last is so very vaguely brought to notice.*

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* The beautiful small Zulu cattle of Natal are humped. The fine Caffre cattle, with very long horns directed almost at a right angle with the axis of the body, and more or less tensely spiral, are large and noble game-looking beasts, with unusually long limbs: from them were the famous " war-oxen " of the Caffres selected and trained.

† The unfortunate supposition entertained by Linnæus as well as Buffon, that the European bison was the original wild stock of all domestic cattle, and the non-recognition of the ancient urus as distinct from the bison, have led to sad confusion in the systematic nomenclature, which can only be satisfactorily remedied by a violation of the generally accepted canons based on the rigorous acceptation of the first-applied systematic names, in this wise :—

Bos americanus, vel Bison americanus : the American bison.

Bos Bison, vel Bison europæus : the European bison. B. priscus, we apprehend, had better be retained, at least for the present; if even in the form of Bison europæus (priscus).

Bos urus : the comparatively modern ure ox.

Bos primogenius : the more ancient type, which we suspect to be quite distinct; albeit the name may have been first bestowed on the other.

To the above may be tacked Sir Stamford Raffle's notice of the domestic cattle of Sumatra. "There is a very fine breed of cattle peculiar to Sumatra, of which I saw abundance at Menang Kabu, when I visited the capital of that country in 1818. They are short, compact, well-made animals, without a hump, and almost without exception of a light fawn-colour, relieved with white. The eyes are large and fringed with long white lashes. The legs are delicate and well-shaped. Among all that I saw I did not observe any that were not in excellent condition, in which respect they formed a striking contrast to the cattle generally met with in India. They are universally used in agriculture, and are perfectly domesticated. This breed appears to be quite distinct from the (flat-horned) banteng (*Bos soudaicus*) of Java and the more eastern islands.—'Transactions of the Linnean Society,' vol. xiii. p. 267.

There is a wild race of some kind in the Island of Celebes, which has not yet been scientifically described. In an account of the province of Minahassa, published in the 'Journal of the Indian Archipelago,' vol. ii. p. 831, we find it thus noticed:—"Wild cows are also found here, principally in the higher parts of the mountains; but they bear little resemblance to the banteng of Java; are below the middle size, yet possess, notwithstanding, an incredible strength." This is vague enough, but undoubtedly refers to some unknown quadruped,—bovine most probably, but not likely to appertain to our present section of the taurines. The statement is nevertheless worthy of citation. The curious little straight-horned buffalo, known as Anoa depressicornis, is however perhaps meant.

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* There is a horn powder-flask in the museum of the Asiatic Society, Calcutta, which is cylindrical, and of true semi-circular bisontine curvature, which was brought from the Shan country by the late Mr. Landers, who assured the writer that he had seen (had a good distinct view of) a true shaggy bison, "resembling the American bison," in the pine forests there. On our expressing doubt, he said that he possessed a horn of it made into a powder-flask, and afterwards presented this to the museum, being the specimen above noticed: certainly it has every character of a true bisontine horn, but might perhaps be that of a wild taurine of the present group. The mere conversion of it into a powder-horn, as a sort of trophy, is rather in favour of its having belonged to a wild bull of some kind.

For the same reason we quote the following from Earl's 'Voyage to the Molucca Islands and New Guinea,' p. 361 :—"Wild cattle are numerous in Timor Laut, of a brown colour, with upright horns, and size about the same as that of two-year old cattle in Holland. The natives catch them with rattan, and also shoot them with arrows."

Again, Mr. Hugh Cuming assured us, that the tamarao of the island of Mindoro (one of the Philippines) is a small bovine species, but fierce and dangerous to attack, of a dark colour, with horns rising at an angle of 45° from the forehead ; therefore not akin to the Anoa depressicornis, which seems to be a diminutive buffalo.

The Tartar cattle of the steppes lying northward of the great Asiatic watershed are, we believe, *all* of the European type ; while in China this would appear to be more or less mingled in blood with the humped races,—as the domestic geese of India are obviously of a hybrid race between Anser cygnoides and A. cinereus! Our information is, however, exceedingly scant and unsatisfactory concerning the breeds of cattle in the Chinese region, comprehending Mongolia, Mantchuria, the Corean peninsula, Japan, Luchu,* &c. ; nor are the essential characters seized with reference to classification of those above described in Siam and Sumatra. The main object of the present sketch is to direct the attention of observers to those leading differential characters.

It would seem that the humpless Tartar cattle referred to interbreed with the yak in the northern limits of the range of the latter, as the humped cattle are made to do in the southern limits of its range: at least we have the evidence of Marco Polo to that effect.

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* The cattle of the Luchu islands are described by Captain Basil Hall as "a small black breed, used principally for agricultural purposes." The presence or absence of a hump is not mentioned, which should be negative evidence of the latter. In some districts of China the humped would seem to predominate, and these are often represented in Chinese paintings. In Chusan the race appears to be mingled, with no great admixture of blood of the humped species. Cattle are generally rare in China, the strange inhabitants of that region having an aversion to milk, omnivorous as they are in most other respects: the Mantchurian Tartars, however, are particularly fond of milk. About Canton, if we mistake not, only buffalos are met with, which are employed to till the ground. It is probable that where taurine cattle are kept, the humped races predominate in the south, the humpless northward, with intermixture of blood where the two meet. The cattle of Butan would seem, from all we can learn, to be of the European or Tartar race, now, it would appear, becoming rare in the province, and the exportation of them strictly prohibited: if so, they have, doubtless, been brought round by an eastern route.

To return now to Europe, which may be regarded as the head-quarters of the cylindric-horned humpless cattle,* and from which part of the world they have been introduced into the Americas and Australian colonies, to the exclusion of other domestic cattle, though perhaps the finer breeds of humped cattle might be better suited to the warmer and drier localities of those grand regions of the earth. *That* is an experiment still worth trying. After the camel, the large humped bullock is the animal of all others best adapted for Australian or South African explorations.

The establishment of Spanish cattle in America "dates from Columbus's second voyage to St. Domingo. They there multiplied rapidly; and that island presently became a kind of nursery, from which these animals were successively transported to various parts of the continental coast, and from thence into the interior. Notwithstanding these numerous exportations, in twenty-seven years after the discovery of the island, herds of 4,000 head, as we learn from Oviedo, were not uncommon, and there were even some that amounted to 8,000. Acosta's report was 35,444; and in the same year there were exported 64,350 from the ports of New Spain. This was in the sixty-fifth year after the taking of Mexico, previous to which event the Spaniards, who came into that country, had not been able to engage in anything but war."—'Quarterly Review,' vol. xxi. p. 335.

Having noticed the rapid multiplication of Spanish cattle in the New World, it occurs to us, as worthy of remark, that European cattle do not thrive equally in India. Why should they not do so as well as at Rio Janeiro? Perhaps because the cattle of intertropical America are derived from an ancestral stock inured and thoroughly acclimatized to the torrid summers of Spain. And perhaps the same race of cattle, if imported into India from Rio or the Bahamas, would take more kindly to the climate than the improved and pampered breeds sent out from Britain. We happen to be among the dissentients who do not regard the beef of the humped ox—even well-fed Gyna beef—as equal to our finely interstratified (with fat and lean) Christmas beef at home; and therefore think that the cultivation of European cattle is desirable, especially in the Nilgiris and other elevated localities when the land-leeches do not interfere to prevent it.

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* A round-about expression; but we have positively no English word to designate the species generally,—bull, cow, ox, bullock, steer, heifer, calf, &c., of which "beeve" (analogous to the French *bœuf*) comes nearest to the mark, more so than cattle, but will hardly apply till the beast is of an age to yield beef! "Black cattle" is most absurd, seeing that they are of all colours; and "horned cattle" equally so, as being neither exclusive nor applying to the "polled" or hornless breeds. Sometimes, as in the Dutch language, this animal is emphatically the "beast," as, in the feathered class, the commonest of domestic birds is emphatically the "fowl;" but has no proper name in English, beyond such as are of more or less general application to all birds, as cock, hen, chick, pullet, capon, &c.; or sometimes emphatically "poultry," which may be compared to "beeve."

Our notice of the "feral" humped cattle has elicited some information from a friend, who tells us that there are many in the now famous Jugdespore jungles, which he has often shot over. The late Kooer Singh granted permission to our informant to shoot what he pleased, so long as he spared the wild cattle, which, according to tradition, had inhabited the district for at least 400 years. Our friend, of course, respected the injunction, but was curious about them, and had opportunities of watching them somewhat closely. All he saw were rather of small size, of an earthy-brown colour, with shortish horns, and he thinks without the Nilgai markings on the feet. We have very long been of opinion that such was the primeval hue of the humped races; but the mottling of the feet—a white ring above the hoofs, set off above and below with black—is so very prevalent among our domestic humped cattle that we cannot help thinking it an aboriginal marking. Another friend informs us that there are many wild cattle of the sort upon the *churr*, or alluvial island, known as the "Siddee churr," lying S. E. of Noacally in the Eastern Sundarbans. He adds that their colours vary, as in ordinary domestic cattle; and he especially approves of the quality of their beef. On this *churr* there is no high tree-jungle, and scarcely brush-wood enough to afford cover for tigers, which do not occur on the island.

To return now to our general subject. The question has been much disputed whether the urus of the old Romans was identical with their bison; and the affirmative has been very ably argued, as by Dr. Weissenborn, in the 'Annals and Magazine of Natural History,' vol. iv. p. 239 *et seq.*; but the two are so repeatedly contrasted that we could never doubt that the names referred to different animals, as in the following passage of Seneca:—

> "Tibi dant variæ pectora tigres,
> Tibi *villosi terga bisontes*
> *Latisque feri cornibus uri.*"—Hippol., *Act I. v.* 63.

The most striking feature of each animal, from what we know of the still-living bison and of the sub-fossil skulls of the huge taurine found in the peat-bogs, being here distinctly indicated. "Wide-horned" might indeed suit the Bison priscus type, of a long anterior and far ante-human period, but is much more applicable to the great extinct taurine than to the modern type of bison. Again, Professor Owen, in common with the other writers on the subject, quotes a very famous couplet, as follows:—"It is remarkable that the two kinds of great wild oxen recorded in the 'Niebelungen Lied' of the twelfth century, as having been slain with other beasts of chase in the great hunt of the forest of Worms, are mentioned under the same names which they received from the Romans.

> 'Dar nach schlouch er schiere, einen wisent und einen elch,
> Starcher ure viere, und einen grimmen schelch.
>
> 'After this he straightway slew a bison and an elk,
> Of the strong uri four, and a single fierce schelch.'"

Which last is believed by some to be the famous so-called 'Irish elk' of common parlance, though Owen is decidedly opposed to that opinion, while offering no other suggestion beyond an allusion to the superstitious fables which abound in that romance. Other authors would identify the schelch with a lynx!

The fact is, that the Roman names are derived obviously from the Teuton. As Professor Nilsson remarks, "The denomination 'urox' is derived from the language which the Germanic race seems to have had in common in the earliest times, and signifies 'forest ox,' wild ox *(Bos sylvestris)*, for 'ur' or 'or' signifies 'forest' or 'wood,' 'wilderness,' and is still used in many places in Sweden, Norway and Iceland. * * * Also, in the older German, 'ur' signifies 'wood,' 'forest,' but has, in compositions of later times, been changed to 'auer;' *ex. gr.* 'auerochs,' *auerhahn*. The Romans, when in Germany, first heard the word 'urocs,' and as they generally changed all names after the fashion of their language, turned it into 'urus.' The uroxen which were conveyed to Rome, and highly prized in the bull-fights of the circus, were by the ignorant confounded with the African Antilopine 'bubalis,'—an error which Pliny notices; for example:—

> "Illi cessit atrox bubalus atque bison."—MARTIAL, *Spect.* 23.

"By our forefathers in Scandinavia, as well as in Germany, this wild animal is, however, not called 'urox,' but 'ur,' or 'ure,' as in the poem of the 'Niebelungen,'—thence 'ura-horn' in our old Sagas. In certain provinces an angry bull is still called 'ure.' The canton of Uri, in Switzerland, takes its name from this animal, and bears a bull's head in its arms."

The name "bison" is equally of Teutonic origin, and Cuvier thought that "wisent," &c., are derived from the German "bisam" (musk); but Dr. Weissenborn suggests, far more plausibly, that "bisam" is derived from the name of the animal in which the smell of musk forms so striking a feature. This author, however, also suggests that the name "bison" may still be of Greek origin, derived from the Greek verb signifying "to cough;" whence "bison," the coughing ox, as the voice of this animal must have struck the Greeks as much as that of the Bos grunniens did the travellers in Tibet; and in this respect the Indian humped bull resembles the bisons, its voice, however, being even more like a cough than a grunt, while that of the cow is also as unlike the low of the European cow as can well be. The latter explanation of the word "bison" we take to be founded on a mere coincidence.

Professor Nilsson remarks of the urus, "This colossal species of ox, to judge from the skeleton, resembles almost the tame ox in form and the proportions of its body, but in its bulk is far larger. To judge from the magnitude of the horn-cores, it had much larger horns, even larger than the long-horned breed of cattle found in the Campania of Rome. According to all the accounts the colour of this ox was black; it had white horns with long black points; the hide was covered with hair, like the tame ox, but it was shorter and smooth, with the exception of the forehead, where it was long and curly.*

"The only specimens which we now possess of this extinct wild ox, are some skeletons dug up, of which two are at present preserved here, at the Museum of the University of Lund, where are also preserved about a dozen of skulls of earlier and later specimens. * * *

"In the Museum of the Royal Academy are fragments of the cranium of the urox, which must have belonged to an animal more than 12 feet in length from the nape to the root of the tail, and 6½ feet high. On one the distance between the base of the horns above is 9½ inches, below 13½ inches; the thickness at the root 15 inches [*i. e.* of the bony horn-cores! The skull of a cow in the British Museum, figured by Professor Owen, measures 30 inches from crown to tips of intermaxillaries!] The largest Scanian ox I have seen," continues Professor Nilsson, "and which was of an unusually large size, measured in length, from the nape to the root of the tail, 8 feet, and was 5 feet high over the mane. When we now consider that bulls and cows never reach the size that oxen do, and that we ought to compare the bull or the cow to the wild ox kind, we shall then easily perceive that this last-mentioned was much larger than the tame ox, and perhaps he was even somewhat bigger in the southern regions, for example, in Germany, than here in Sweden. Cæsar's account that the urus was 'magnitudine paulo infra elephantos,' was not so exaggerated as one has imagined."

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* Lengthened and curly hair on the forehead is, indeed, an especial feature of the present group of taurines, as before remarked, and not only as compared with the smooth-fronted humped cattle, in which hardly a tendency to lengthened hair upon the forehead is commonly shown, but equally with the third or flat-horned group of taurines, as the gaour, gayal, banteng, &c. True, Mr. Hodgson figures his Gouri gau with a very curly forehead ('Journal of the Asiatic Society,' x. 470); but he describes the hair there as merely "a little elongated and slightly waved or curled" (p. 464); and of several gaour-heads, with the skin on, that we happen to have seen, not one presented anything like the curly front of an English bull, and in fact the lengthening of the hair had to be looked for to be observed at all, and its waviness still more so. The hair of the forehead is a little elongated also in the gayal and banteng, but only noticeably so when specially examined.

The size of the urus may, in fact, be estimated as at least one-third larger, in linear dimensions, than the largest breeds of existing European cattle, and with proportionally even larger and longer horns than certain Italian, Sicilian and Hungarian bullocks, which are noted for the size of these appendages. Such were the formidable animals which Julius Cæsar describes as both strong and swift, at the same time so spiteful that they spared neither man nor other creature when they once caught sight of them. With the chase of these animals the Germanic youth became hardened, and the greater the number of horns of dead oxen they could exhibit the more highly were they esteemed.—(Bell. Gall. vol. vi. chap. 28.) One of Professor Nilsson's specimens "has on its back a palpable mark of a wound from a javelin. Several celebrated anatomists and physiologists of the present day, among whom," he remarks, "I need only mention the names of John Müller, of Berlin, and And. Retzius, of Stockholm, have inspected this skeleton, and are unanimous in the opinion that the hole in question upon the backbone is the consequence of a wound which, during the life of the animal, was made by the hand of man. The animal must have been very young, probably only a calf, when it was wounded. The huntsman who cast the javelin must have stood before it. * * * It was yet young when it died, probably not more than three or four years old, and not unlikely was drowned by falling through the ice into the water, where, in after times, a turf-bog has formed over it. The skeleton lay with its head downwards, and one of its horns had penetrated deep into the blue clay which formed the bottom under the turf." *

A middle-sized European taurine is named Bos frontosus by Professor Nilsson. Its remains "are found in turf-bogs in Southern Scania, and in such a state as plainly shows that they belonged to a more ancient period than that in which tame cattle existed in this country [Sweden]. This species has lived in Scania contemporaneously with the Bos primogenius and Bison europæus; that it has also been found in England is shown by a cranium in the British Museum. As with us it belongs to the country's oldest 'post-pliocene Fauna.' * * * If ever it was tamed, and thereby in the course of time contributed to form some of the tame races of cattle, it must have been the lesser large growth, small-horned and often hornless, which is to be found in the mountains of Norway, and which has a high protuberance between the setting on of the horns above the nape."

A third is the Bos longifrons of Owen, small and of slender build, and elaborately described by Nilsson. Found in turf-bogs, and in relatively older beds, together with bones of elephant and rhinoceros. Professor Owen thinks it probable that the small shaggy Highland and Welch cattle ("kyloes" and "runts"), with short or often no horns, are the domesticated descendants of Bos longifrons. †

Professor Nilsson sums up by remarking that, "We believe we come nearest to the truth in this difficult subject, if we assume—

"1. That the large-sized lowland races, with flat foreheads, and for the most part large horns, descend from the urus (*Bos primogenius*), and came into Sweden with a race of people who immigrated from the south and west.

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* According to Colonel C. Hamilton Smith, "the bull-fights in Spain originated in the chase of the wild urus; and a Celtiberian vase, with an undecyphered Celtiberian inscription, represents the animal and its hunter." The Spanish bull-fights are generally supposed to have descended from the Roman combats of the circus.

† Within the last two or three years we have read in one of the scientific periodicals, but just now have sought in vain for the notice, of a quantity of bones that were dug up in some part of England, together with other remains, of what seemed to be the relics of a grand feast, held probably during the Roman domination of Britain (if we mistake not, some Roman coins were found associated). There were skulls and other remains of Bos longifrons, quite undistinguishable in form from the antique fossil, whether wild or domesticated, which of course remains a question; but Cuvier figures, in his 'Ossemens Fossiles,' the skull of a small Scottish Highland ox (as we take it to be), which can scarcely be other than a domesticated descendant of that particular aboriginal species. We also happen to possess a drawing of the skull of a small Highland bull, with descending horns, as in Cuvier's figure, which we have no hesitation in referring to the antique species. If we mistake not, the discovery of the quantity of bones above mentioned, is recorded in the first volume of the 'Proceedings of the Linnean Society,' which does not happen to be available to us just now.

"2. The somewhat small-growth Highland races, with high occiput, and small or no horns, descend from the high-necked ox (*Bos frontosus*).

"3. How far the small-grown hornless Finn-ko race descends from the dwarf ox (*Bos longifrons*) may be more fully determined through future investigations.

"We can take it for a given and general rule," he adds, "that the tame race is always less than the wild species from which it springs."* Of this we are not so sure. Indubitably the larger breeds of domestic rabbits, geese and ducks, pigeons and common fowls, vastly exceed in size their wild progenitors; and the heavy dray-horse is probably another instance. We therefore feel a difficulty in reconciling even the largest races of humpless domestic cattle with the gigantic urus. The probability is, that other and unknown wild races have contributed to produce the domestic cattle of Europe and Northern Asia,—*e. g.* that formerly inhabiting the Ardennes, &c. (if different from the bison), even the Assyrian wild cattle, and perhaps more that we know not of; and the races so originating being now variously intermingled. An exceedingly near congener of the urus, but smaller, existed in the Indian fossil Bos namadicus;† and it is likely that others have existed which may yet be recovered in a sub-fossil state. Moreover, this supposed multiplicity of origin of the races of domestic humpless cattle may serve to hint the probability of more than one primal origin for the humped races, varying, as they do, so immensely in size, and more or less in a few other particulars.

The name Bos taurus, accordingly, seems to crumble to pieces like Ovis aries, Capra hircus and one or two more; but will always be useful in designating the aggregate of the particular domestic group, as apart from the humped races, which most assuredly have no common origin with the others.

We conclude this long notice of the present group of taurines by giving some measurements of large bullock-horns, which we took many years ago in the Museum of the Royal College of Surgeons, London. What the horns of an ox urus might have attained to we are almost afraid to conjecture.

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* Professor Nilsson's admirable treatise will be found translated in the 'Annals and Magazine of Natural History,' Second Series, vol. iv., pp. 256, 349 and 415.

† There is a fine skull of this species at the Museum of the Geological Survey Office, Calcutta.

Lithuanian ox (No. 1084 of Museum Catalogue). Absolutely similar in flexure to B. primogenius. White with black tips; 28 inches long, 12 inches in girth, and 88 inches from tip to tip.

Transylvanian ox (No. 1087). Colour black; 3 feet long, and 13 inches round at base.

Italian ox (No. 1088). Mottled white, dark-tipped; 37 inches long, 13 inches round at base.

Remarkable pair brought from America (No. 1091). Slender and curved as in the more ancient type of B. primogenius; 49 inches long, 12 inches round at base, and from tip to tip—following the curvature outside, and including forehead—10 feet 4 inches.

From a note supplied by Mr. John Stanislaus Bell, who resided some time in the interior of Circassia, we cite that "there were no cattle of a humped breed, nor any with coats so shaggy as those of our Highlands. The only remark I recollect to have made was, that there had been much mixture of Highland and Lowland breeds, from the low stature and short and slightly curved horns of some, and large ponderous frame and huge curved horns of others; while the colours of all seem to embrace all the varieties we have in our island."

Colonel C. H. Smith remarks, that "the breeds of the Kirghiz and Kalmuk Tartars, those of Podolia and the Ukraine, of European Turkey, of Hungary, and of the Roman States, are amongst the largest known. They are nearly all distinguished by ample horns spreading sideways, then forwards and upwards, with dark points; their colour [that of the horns] is a bluish ash passing to black. That in the Papal dominions is not found represented in the ancient bas-reliefs of Rome, but was introduced most probably by the Goths, or at the same time with the buffalo.*

With this quotation we terminate our somewhat rapid notice of the European type of taurines.

(To be continued.)

Reason and Instinct. By the Rev. J. C. Atkinson, M.A.

In the part of the inquiry on which we are now about to enter, a degree of intricacy is noticeable at the outset, which may throw sensible obstacles in the way of our arriving at a satisfactory conclusion.

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* We have elsewhere met with the statement that buffalos were introduced into Italy by the Lombards in the sixth century.

We have already established, from the results of observation, that a vast variety of animals, beginning with man at the head of the scale, and proceeding downwards, manifest, in addition to the workings of Instinct — whether more or less potential and operative — certain peculiarities of conduct, which can only be attributed to the possession and the action of a power of Reasoning. And we have also glanced at what appeared to be sufficient reason for arriving, *à priori*, at the conclusion that such would be the case; those reasons originating in the fact that there is valid ground for supposing the minds of the inferior animals to be essentially of the same nature as that of the human race; and that therefore it would be strictly reasonable to look for general features of resemblance in the different series of actions performed by the animals in question; the resemblance, of course,—however variable in degree,—being such as must result from the operation of the same or similar disposing causes, but combined for operation in very variable degrees. And, from the results of observation, thus reinforced by those of a course of independent reasoning, we deduced the conclusion that Instinct presupposes Reason; at least with certain limitations, and subject to certain definitions.

Our first apparent difficulty is,—it may be from entire want of information,—that in not a few of not the lowest animals in the scale of Creation, we find certain indications of Instinct as an influential principle of action, but scarcely any of Reason; I say, in not a few of not the lowest,—for there seems to be but little reason for believing that in many of the lowest gradations in animal life there is any power of action, properly so-called—that is, of conscious action—at all. Most of the movements of such creatures, perhaps even all their movements—in other words, every individual evidence of their possession of animal life—seem to be due to organic sensibility or irritability, and to that only. Take the familiar illustration of the oyster, whose life even is almost made a jest of,—and there are hosts of other creatures even lower than the oyster in Nature's animated chain, we scarcely venture to raise the question that it may procure its food and propagate its species, and by the use of the limited means for that purpose at its disposal, avoid certain risks to its well-being or continued existence, through Instinct. We seem forced to conclude that it has no consciousness, but a faculty of Sensation we concede; although, even in this, it must be observed, we are proceeding in the dark; for what do we know—not assume as known—but really know of these and kindred matters, in connection with the oyster and other similar, or lower forms of existence? We reason from what we do know, and by analogy, to what we do not know; and certainly it is conceivable that our conclusions may be wrong.

But I am sure of this, that whether or no we are wrong in denying the presence, at least, the operation of Instinct in all these creatures, the Instinct of those creatures in which the presence and influence of that Power is only just displayed is very different in power or degree (probably not the least so in nature), and in results, from that of the alligator, the salmon, the swallow or the rabbit. In the one case, it is a stream flowing on to its outlet, but a stream of small volume and inconsiderable motion; and one or two small mouths are sufficient for its debouchure. In the other case,—that of the higher animals,—on the contrary, the stream is of greater—it may be, vastly greater — volume and velocity; and it rushes on to the ocean of Action through many and various and considerable branches and outlets.

I think that this is an important consideration:—that Instinct—assuming that Power or Attribute or Essence to be the same in all cases; viz., a "determination to act, given by Almighty Wisdom"—acts with different degrees of intensity, as estimated by its collective results, in the different orders of creatures whose conduct is perceptibly influenced by it. I mean, that in some — at the lower end, so to speak, of an ascending scale—the operation or influence of unquestionable Instinct is only just recognisable with sufficient distinctness; in others near the other end of the scale it is very strong and influential indeed; and that between these extremes every intermediate modification of power and energy in its action may be met with. That this observation is well-founded, I think scarcely any one will be disposed to deny who compares the instinctive actions,—say of an earthworm, a snail or a caterpillar with those of a wild duck, a dog or a monkey,—and then bears in mind the list of heads, confessedly imperfect, under which the instinctive actions of animals must be arranged, and how remarkably, as we descend the scale of animated life, the decrease of evidences of instinctive action, in its strongest forms, keeps pace with the descent. It would not be difficult to illustrate this point by successive comparisons of the instinctive tendencies and performances, taken separately and collectively, of a reptile with those of a fish, a bird, and a quadruped belonging to one of not the highest classes: and we shall adduce something of the sort a little further on.

And with a view to obviating the difficulty suggested above, I would observe that the successive comparisons just named will probably lead the way to—perhaps even prompt—the suspicion, that where Instinct is very inert in the exercise of its influences, there Intelligence also must be found to be proportionably low: that as the impulses of Instinct become more pronounced and decisive, the operation of some other motive to action—also of variable power, and sustaining accessions of strength co-ordinate to those of Instinct itself—may also present unmistakeable evidences of its presence and potency; this other motive being, in plain terms, the motive of Reason and Will.

And certainly, the suspicion, once aroused, will, in no long time, be converted into conviction: Instinct and Reason will appear to go hand in hand together, at least up to a certain point; at which this is seen to take an immense stride in advance, that to become, as it were, oppressed and obscure, and more and more unable to exhibit either its power or its presence, as heretofore. I do not mean that up to the point specified they keep even pace with each other; that a certain increased activity of the Instinctive agencies presupposes a certain corresponding and proportionate increase in the Intelligence or Rational faculties; but simply, that as we proceed from one class of animals to another, if we find Instinct is, in the new class, more strongly developed and more remarkably exercised than in that we have just passed from, we shall also find that in that class greater Intelligence also and greater Adaptiveness—without attempting to say how much greater — will be observed to prevail than in the former class. It may be then, that when we are investigating the case of an animal in which the manifestation of Instinct-agency is as low as possible consistently with admitting of recognition, the intelligence of the animal in question shall be so low as not to be discoverable. At the same time, while admitting the possibility of this, we ought to bear in mind that in very many of the cases which might, perhaps, be alleged as cases in point, we are, as yet, possessed of no information, sufficiently precise and close, as to the habits and lives of such creatures; no information such as only intimate acquaintance with them and the closest observation of their ways would furnish us with. And for my own part I feel little doubt that where we are fortunate enough to possess adequate information, the result will go to prove the truth of the theory that under the limitations above adverted to, Instinct presupposes Reason.

And certainly, as we proceed with an examination of the successive links of the chain, presenting—as we have said—up to a certain point, successive advances in the tokens and proofs of Instinct-energy, we shall meet with much to assure us that we ought not too hastily to conclude that this or that quality cannot be then because we fail to recognise it at the outset of the inquiry. For we shall find, from time to time, certain Instincts themselves, under the influence of altered circumstances, fading away, almost dying out; only to recover their pristine force when the altered circumstances revert to their former type; and besides that, new habits and manners—certainly not due to Instinct at all—growing up and obtaining permanent subsistency, in cases where nothing of the sort would have been looked for originally, and most certainly not found if looked for.

And now we have reached a point at which it may be permitted us to advert to the confirmation secured to our theory by the successive developments of the brain in the several classes of animals; noticing at the same time their corresponding psychical development, as we successively proceed from the lower to the highest classes of animated life.

I suppose that it can scarcely be seriously objected that the comparative Anatomy of the brain can have no connection with, or bearing on, the enquiry in which we are engaged. It seems as impossible to question the fact that the brain is the material organ through which, in the animal, Instinct acts, as that it is the organ through which, when more highly developed, true Reason or Intellect acts. Anatomy shows that from the simplest, indeed, most rudimentary form of brain in the lower animals, to its highest, most complete development, there is a mechanical contrivance and arrangement employed, identical as to its general principle, in all from the lowest to the highest; differing only in what may be called the degree of nicety and completeness and finish with which the plan is carried out in each successive step. In every creature in existence possessing a brain, however rudimentary, there are a series of nerves of sensation (few, or inconceivably many, as the case may be) which are the telegraphs to the brain of external incident; and there are nerves of motion, which are telegraphs from the brain, of instruction and direction for the various organs which are elements in the composition of each several creature's physical frame. And in addition to this principle of general identity, experiment steps in and declares authoritatively not only that there is no apparent or discernible difference between the uses and the operation of the nervous system in the highest animal and in the lowest, but that also such and such parts of its cerebral centre may be demonstrated to have and to fulfil such and such functions. So that, in point of fact, we may at once assume it to be placed quite beyond controversy that the entire brain, or some part or parts of it—the variation between the whole and a part depending on the class in the animal series which may happen to be under discussion—is the mechanical engine through which Instinct acts upon the other faculties of the animal. Indeed a good deal has been already done in the direction of deciding what particular parts of the brain are connected with such and such Instinctive tendencies and operations: thus Sir B. Brodie says, "Those bodies situated in the base of the brain, to which in the human subject we give the names of *medulla oblongata, cerebellum, thalami, corpora striata* and *tubercula quadrigemina*, and the parts corrresponding to these in other vertebrate animals, are connected with that class of phenomena which belong to the animal appetites and instincts."—p. 175.

We proceed then with our endeavour to show that the Comparative Anatomy of the brain, from the most rudimentary to the most complete, in the various orders of animal life as contrasted with the different, but corresponding, degrees of development of Instinct and Intelligence jointly—displayed as each order in succession comes under observation—is not simply very interesting, but very significant likewise. And this, too, notwithstanding the fact that the sum-total of our information on the entire subject is confessedly, in many respects, meagre and unsatisfactory to a degree.

Commencing with a very brief notice of the nervous system of the Radiata, we find no traces of a brain or even of a brain substitute, properly so called. In some of the higher Echinoderms there is an apparent advance in the nervous apparatus and an occasional glimmer of something which looks like incipient Instinct. The instances adduced by Mr. Couch (Ill. Instinct, p. 12) are not only interesting but contain one more proof, if proofs were wanted, how invaluable accurate and abundant information as to the habits and peculiarities of the lower animals would be to us; as they also suggest the more than possibility that Physiology has still much more to do than it has already done, in revealing to us the complete structure and uses of the nervous system and its separate components, especially in these lower classes: he says, "The class of star-fishes (*Asteriadæ*) show the earliest manifestation of an advance towards a true nervous system: for though seemingly very inert and destitute of intelligence they display some sagacity in the discovery and choice of food, as well as in the manner of seeking it. The common sea-hog or sea-egg (*Echinus Sphæra*) though apparently destitute of every sense, or possibility of regarding external objects by sight or hearing, will travel up the rods of a crab-pot, enter the opening, descend within, mount again to the situation of the bait, and select the particular one that pleases it best."

Proceeding now to the Mollusca, we find in the lowest class of this department no very striking advance in nervous development over the creatures last noticed; but as we proceed with our investigations in the higher classes, we meet with what either is or may be regarded as a brain proper. A certain ganglion receives an accession of size, and at the same time is evidently charged with the performance of certain distinct functions, such as are unquestionably discharged by the true brain. But I cannot do better here than avail myself of Mr. Couch's able and lucid statement on this part of our present subject. "In this manner in the Molluscan Conchifera, there is a ganglionic distribution to the single organ termed the foot, by which voluntary motions are elicited; and we are thus enabled to judge that this enlarged portion answers to at least a portion of the cerebellum: and this is the earliest development of real brain to be met with in the ascending scale; and the advancement undoubtedly does not consist in the mere increase of size, but in an acquirement of some additional organization. The common mussel (*Mytilus Edulis*) possesses this foot and corresponding ganglion; and, therefore, though not capable of positive change of place, it is able to extend and direct the organ in such a manner as, with some approach to consciousness, to direct the application of its mooring threads or byssus, so as to secure stability of situation. The oyster, Anomia and kindred genera, which remain fixed by calcareous adhesion, are destitute of the foot and the ganglion, and are consequently among the lowest in the scale of nature of molluscan animals. But in the highest of these orders or families, the Gasteropods or cuttle fishes, not only is this nervous system much more highly organized and developed, but the ganglia begin to assume the form of a real brain, inclosed in a defensive case approaching to the nature of a cranium; and accordingly their faculties of intelligence and passion approach closely to those of fishes. They are capable of manifesting some degree of curiosity, as is seen in their moving up to a shining object to examine it; and in the presence of danger they become suddenly suffused with a decided blush of red, and then eject the contents of their ink-bag, by which they become shrouded from observation and baffle pursuit."—'Ill. Instinct,' pp. 10, 11.

Now it may be fairly remarked here that these creatures not only exhibit, in their actions, indications of Instinct in respect of fear, food-craving, sexual love, hybernation and local direction, but also, from time to time, at least faint traces of a power of action with an end in view. The cuttle fish in discharging its ink must be guided by some sort of judgment; the garden snail, too, which not only retreats into its shell at the approach of apparent danger, such as the adhibition of the finger or other object, but after a pause issues and seems to be occupied in investigating the cause of disturbance, if it be still near but not actively offensive.

Our next step in advance brings us to the class of Fishes. Among these, universally, the mass of the brain is very small in proportion to the mass of the body, though the proportion is an exceedingly variable one; but still the encephalic mass consists of more parts, and those parts comparatively more developed. There is a cerebellum in addition to the spinal cord and medulla oblongata; and besides this, the optic lobes are well defined, and there are what appear to be rudimentary cerebral hemispheres; while in some, olfactory nerves are found also. Endless variations in relative size of these several ganglia are also found, as well as the variations of total size of brain already referred to, many of which already admit of illustration in the habits and peculiarities of the several fishes concerned, and about which no doubt progressive physiological and Natural History discoveries will reveal much more before long; but, on the whole, it is an unquestionable fact that the brain in the class of fish is, in respect of contrivance and development, an advanced and advancing organ. And on the other hand Instinct and Intelligence both keep pace, speaking generally, with the ascertained advance of the mental organ. The former operates, taking the class as a whole, in most of its accustomed channels,—powerfully in some. As cases in point I may cite the parental affection of some species for their ova or young; the strong evidences of the operation of the instinct of sexual love, which the history of others affords; the return to their breeding streams of others again; and the periodical arrival at, and passage beyond given points, of inexhaustible shoals of other varieties; and so on. In fact, the increased operation of Instinct in fishes is too evident to require more than passing notice or illustration; and, moreover, in strict analogy with the advanced organization of the brain, we find marked advances in Intelligence or towards Rationality in all the varieties of fish with which we have anything like a sufficiently intimate acquaintance. Thus, some of them are known to recognise sounds, and to connect with the sound the idea of food; some have recognised persons even, manifesting no great unwillingness to be even handled by some favoured one, but carefully avoiding familiarity with strangers; they certainly learn by experience, as in the case of the artificial fly, which is eagerly seized the first time it is offered, and as obstinately rejected—however pertinaciously presented to them—on all subsequent occasions, if the cheat have been safely detected at the former trial. Similar intelligence is displayed also in another line. Almost all the fish which may be taken with a bait, whether natural or artificial, seem to feed on with perfect indifference, although sheep or cows or other quadrupeds are standing conspicuously, or feeding, on the bank of the stream or other water containing the fish; but if the angler displays himself carelessly and conspicuously, the rule is that the fish he wishes to capture will not take his bait; and it is a rule that does not admit of many exceptions. The clearer the water the more need to fish fine and far off; the higher the bank, the more necessity to get to its bottom, and by no means to make a public spectacle of yourself on its edge. Nay I have even thought, in some of my angling experiences, that my pointer dog, if he advanced a few paces in the direction in which my flies were thrown, effectually rendered all my skill to no purpose, while half a dozen sheep quietly feeding in the same place would have made scarcely any difference; and this certainly evidences a distinct power of comparison as possessed by the scaly tribe. No doubt, in the case of the artificial fly, rejected after experience once had of its fictitious nature, the impression produced by it on the mind of the fish is evanescent: it may be taken in the same place by the same fly the next day, or after discoloration and re-clearing of the water, and possibly even with a precisely similar fly sticking in some part of its mouth, but this simply proves that its memory is bad, and does not in the least degree affect our argument. Again, in ascertaining and selecting, and maintaining by force of arms, if necessary,—very likely using those means for the purpose of ejecting a former occupant of the position best calculated for furnishing a good supply of any coveted food (an established habit of divers fishes, which every angler, who knows even the rudiments of his science, is not slow to avail himself of, particularly in waters which are familiarly known to him),—fish manifest a principle of action which is clearly not instinctive, but depending on observation and experience, and therefore intelligent. The same point is strangely, though painfully, illustrated by the shark, which follows the course of the slave ship with inveterate pertinacity; or, it may be, the other ship in which a mortal sickness is raging and consigning daily victims to the deep.

The next step higher brings us to the Reptiles; among them—with different degrees of comparative variation, as before—we find, on the whole, a larger proportionate brain, and its constituent parts somewhat more highly developed; and, at the same time, a gradual advance in both particulars as we ascend from the lower to the higher members of the class. And once more, in perfect analogy with what we have advanced in speaking of fishes, we meet with stronger instinctive impulse—stronger, that is, in the aggregate, or sum-total of instinct-influence—and correspondingly stronger developments of Intelligence. It is a sufficiently well-known fact that toads and frogs, tortoises, lizards and snakes* are all capable of domestication; and the mere fact of susceptibility to such influences as are implied in the word "domestication" at once invests those creatures to whom it can be correctly applied, with something very distinct from, and much in advance of, mere Instinct. The domesticated creature evinces in such of its actions, or series of actions, as give rise to the declaration that it is domesticated, the presence of memory, of confidence, of attachment. The confidence it manifests results, beyond doubt, from a process of reasoning founded on continued experiences recorded by means of memory, and becomes developed into personal attachment: and this, altogether independent of the fact, that a certain course of training is necessarily carried on, by which the domesticated creature is permanently affected in other ways besides those of its affections. And the inevitable inferences, thus deduced from a portion of the history of the reptile tribe, are sufficiently confirmed by a reference to the observed habits and peculiarities of others of the tribe still in the state of nature, and unsubjected to any influences beyond those which are, strictly speaking, natural to them. For the purpose of illustrating this remark, I must be content with a reference to observations made by Dr. Livingstone on some of the habits of the alligator, and a brief notice of the power of fascination undoubtedly possessed by many species of snakes. The alligators not only, like the fish already noticed, manifest considerable judgment in selecting favourable places as feeding-grounds, but display evidences of careful design in their attempts to seize their prey; thus one of these reptiles, on one bank of a river, is observed to notice a possible prey on the other bank, or rather entering the water from it; the wily creature sinks itself below the surface on its own side and swims under water swiftly across in the direction of its intended victim, the ripple on the water sufficing to reveal to the observant human eye, which was watching the evolutions of the brute, the secret path that would have been unnoticed by its destined quarry. This appears to me to be a most remarkable instance of intelligent design, and a distinct advance on any which, so far, is recorded of a fish.

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* I pass by without comment in the text the exaggerated idea of the craftiness and so-called wisdom of the serpent, which seems to have prevailed universally in the ancient world. Such expressions as "wise as serpents" are probably due to this idea as their origin, as also the fabulous tales recorded by Pliny and others as to the subtlety and astuteness of those creatures. I may observe also that whatever the reputation of those creatures for cunning or wisdom in these old myths, the enormous magnitude and might, as commonly attributed to them in ancient fable or tradition, is equally remarkable. Whence the origin of this popular and wide-spread impression of the attributes of the serpent is a question opening an ample field for a most interesting and instructive enquiry.

The fascinating power possessed by serpents—and certainly by man and some other animals, at least in a degree—is a most remarkable power. Unfortunately we know too little of its nature and mode of operation, and of the means by which it is exercised, to render any argument founded upon it a safe one. It is alleged to reside in the eye of the snake employing it; and there is an unquestionable power resident in certain human eyes, both over mankind and over the lower animals. But whatever it be, and wherever situate, it seems to be perfectly volitional on the part of the reptile employing it. It is one means, among others, by use of which it procures its prey, and I believe nothing is more certain than that it does not make use of it, if it be enabled to secure its prey by other means; and if this be so it appears to argue a species of adaptiveness in its appliance by its possessor which renders the circumstance equally interesting to us, and for the same reason, with that anecdote of the alligator just quoted.

Our next advance places us among the Birds; and in this class, while we find a greatly advanced development of those parts of the brain which are believed to be connected with the various instincts, we find also, not perhaps a proportional, but still a very considerable, advance in the development of the cerebral hemispheres; and their connecting medium, the corpus callosum, begins now to have a rudimentary existence. In other words, those parts of the brain, believed with utter certainty to be connected with the higher functions of Reason and Will, begin to have a distinctly developed existence. It is hardly necessary to say the corresponding psychical advance, including under that term both instinctive and rational peculiarities, is certainly equally marked with that of the material organ through which those powers are enabled to act.

In point of fact, the presence and operation of Instinct is almost, or fully, as strongly and variously manifested in the different orders and families of birds as in any portion of the animal creation whatever;

and without question, on the whole, very much more decisively and distinctly than in any of the lower classes. Indeed, so remarkably is the truth of this statement borne in upon the observer, that we feel ourselves constrained to assent to the opinion expressed by a great physiological writer, that the bird is indeed the creature that of all others acts under the impulses of Instinct. And when we contemplate the wondrous skill with which the tiny architect constructs its first nest, or the marvellous power of self-guidance with which it wings its way, for hundreds on hundreds of untracked miles, or the readiness and decision and perfect mastery of its limbs with which the young water-bird, for instance, takes to its destined element, when yet but an hour or two old, or the wonderful discernment by which others go to their food,—their means of information and discovery being perfectly beyond the reach of any powers of investigation belonging to man,—or any other of the wonderful Instinct-prompted achievements of members of this class,—bearing in mind the while that oftentimes several of these marvellous powers are centred in one and the same individual,—it does seem difficult to attempt to gainsay the opinion we have just now quoted.

But, however marvellous the Instincts of the bird, the Intelligence of this class as a whole is, though less conspicuous, still a very real and important element in its character and qualities. The docility of many of even the wildest and fiercest members of the family; the remarkable adaptation of numbers of others to the influences of domestication; the strong personal attachments formed by hundreds and thousands, of endless varieties, to their owners or their companions, feathered or quadruped; the innumerable instances of cleverness, reasoning (within certain limits), judgment, comparison, persevering labour for a given end, combination to effect a desired object and the like,—all show the bird to be as much beyond the reptile in intelligence or rationality, as the latter is above the classes beneath that to which itself belongs.

The last step, before that which brings us to Man, places us among the Mammalia: here we find a remarkable development,—remarkable for its progressiveness as well as for its ultimate magnitude,—as we ascend the scale from the Marsupialia to the Quadrumana. The true brain from being but little in advance, in point of organization and relative magnitude, over that of the bird, becomes at last inferior, in proportionate size and development, only to that of man himself, while those portions of the encephalic mass which are appropriated to the several instincts, though maintaining positively some sort of relation to the size of the animal, become, relatively to the continually increasing development and magnitude of the cerebral hemispheres, as continually less and less.

Instinct, then, in this class, according to the testimony of Physiology, should—without losing much or perhaps any of its intrinsic energy, as exhibited in preceding classes—cease to assert the paramount power and influence it has hitherto exerted: and accurate and trustworthy observation, so far as its results have yet been accumulated in anything like a satisfactory or sufficient amount, goes far towards supporting the inference. Instinct may be still, in the lowest classes, the influential motive to action, though still, in general terms, rather less so than in the bird; but somewhere between the lowest and the highest classes—it is perhaps impossible, in the present state of our knowledge, to fix the precise place where—there is a point at which Instinct, never ceasing throughout the class to exert its own appropriate power and produce the requisite results, yet seems to forego its hitherto imperious claims, and either to employ, in a much greater degree than ever before, or else become subservient to, the coordinate power of Rationality. Any way it is most certain, that as we go from link to link in the long chain presented by the Mammalia, whether it be that the beings composing those links, especially towards the higher part of the chain, are for the most part better and more familiarly known to us, or that the workings of their rational part or intellectual essence are more distinctly visible to us,—constellations, as it were, contrasted with nebulæ,—we are, as our attention is roused to note their proceedings, sometimes almost startled, always strongly impressed with the signs and tokens and proofs that their mind is a reality,—a something far, very far beyond a mere engine of nothing better than instinctive workings.

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Danby Parsonage, Grosmont, York,
February, 1859.

The Tiger "Jungla" and a Bull-calf of the gigantic Gaour (Bos gaurus) *shipped for England.*—By the "Nile,' which proceeded down the river yesterday morning, we hear that the celebrated huge tiger "Jungla," the largest and most beautiful of the famous fighting tigers of Lucknow, is shipped for sale in England. This splendid animal is not only remarkable for his size, which far surpasses that of any tiger or lion yet seen in Europe, but for the extraordinary beauty of his colouring and markings, having all his body-stripes double: he is, moreover, extremely tame and gentle to those he knows; but many a big buffalo has been felled by his tremendous sledgehammer of a paw: there was, in fact, no sport at all about his method of procedure; he went most systematically to work, and the business was done in no time. In a civilized country he will of course have to forego the pleasure of such feats; but we doubt not that he will become an object of great admiration for his size and beauty. By the same vessel is likewise forwarded for sale in England a fine, healthy yearling bull-calf of that very rare animal to obtain alive, the gigantic gaour (*Bos gaurus*), which sportsmen in India persist in miscalling the bison: it is the largest of existing bovine animals, the finest bulls even exceeding 20½ hands high, measuring from the summit of the singularly elevated dorsal ridge (*vide* 'India Sporting Review,' new series, vol. iii. p. 329, and vol. v. p. 210). This indeed is one of the most remarkable features of the species, the spines of some of the dorsal vertebræ measuring 16 inches in length. Another characteristic of the adult animal consists in its very broad concave forehead, surmounted by a high transverse arched bony ridge between the horns; the skull is extraordinarily massive: we have seen one which, with the horns attached but *minus* the lower jaw, weighed exactly thirty pounds. The peculiar form of the head is scarcely even indicated in the yearling calf, and the animal is a very slow grower; we have heard of one which lived for three years in the possession of an officer in the Madras Presidency, and was still to all appearance a mere calf. This is doubtless the first gaour (*Bos gaurus*) ever shipped for Europe, and the species must not be confounded either with the gayal (*B. frontalis*) or with the banteng (*B. soudaicus*). Though only generally known as a wild animal, we have been assured that the gaour, in addition to the gayal, is domesticated in the interior of the Tippera hills. The calf at present on board the "Nile" retains not a vestige of wildness, but is as quiet and tractable as any ordinary domestic animal.— ——— ——— *Calcutta, December* 8, 1858.

Occurrence of a Piebald Specimen of Mus rattus near Carlisle.—A beautiful piebald specimen of this small animal was caught at Coathill on the 6th of January, 1859. On one side of the animal is a large clear white patch, on the other several smaller ones; the head, neck and breast is of a lightish brown, intermixed with numerous jet-black hairs; the hinder part is of a similar colour.—*Thomas Armstrong; 12, Barwise Court, English Street, Carlisle.*

Showers of Feathers.—In reading a most interesting article by Captain Blakiston, in the 'Zoologist,' I was attracted by the following passage (Zool. 6324):—"While we were in that land of water-fowl below Cumberland, I witnessed a shower of feathers: as we sailed up a reach of the river with a fresh breeze, without the knowledge of a human being within many miles of us, it appeared to be snowing; this was nothing more than small feathers, and we supposed that at some Indian camp in the swamps to windward the operation of goose-plucking must be going on; these feathers had likely travelled many miles, and would continue while the breeze lasted." Now Herodotus, in speaking of the northern Scythian tribes says, "But as to the upper country, which lies to the north of the extreme inhabitants of the land, they say that it can neither be passed through nor discerned by the eye, on account of the showers of feathers (πτερῶν κεχυμένων); for the earth and the air are so full of these that they effectually shut out the view."—(Book IV. chap. 7.) To this Mr. Blakesley appends the following note:—"This is a misrepresentation of the falling flakes of snow, which, in the old German mythology, was represented as feathers tumbling from the bed of the goddess Holda, when she shook it in making it." In the thirty-first chapter of the same book Herodotus delivers a similar opinion in these words, "Concerning those feathers, of which, as the Scythians say, the air is so full that they are neither able to see the country that lies beyond them nor to travel through it, my opinion is this: in the upper parts of this land there are continual falls of snow, and these are less frequent in summer than in winter, as one would naturally suppose: whoever has observed, from close by, snow falling thickly, will understand what I say, for the snow resembles feathers; and owing to this severity of the climate the parts to the north of this region are uninhabitable: the feathers, then, is a name which the Scythians, in my opinion, give to the snow, indicating the similarity." I merely make these quotations for the purpose of ascertaining whether the theory of Captain Blakiston is to be received against that of Herodotus and Mr. Blakesley, and with the hope that an investigation of the subject may throw light on two passages of the great historian. It also shows that, as our researches in Natural History extend, so will other works become more comprehensive to us, and particularly the writings of Greek and Roman authors. Captain Blakiston does not say whether he was actually in the shower or not; and, should this meet his eye, I trust that he will make a further communication on the subject. If he only saw them at a distance, I must say that I incline to the opinion of Herodotus. In case of his ever being caught in a similar phenomenon, it would be worth while to send by post to England one or more of these feathers,—if they be *bonâ fide* goose-down, and not snow-flakes,—for this would settle the matter beyond doubt or dispute.—*T. W. Greene; Tonbridge, February* 3, 1859.

Occurrence of the Goshawk in Suffolk.— About three weeks since an immature female of this species was killed at Somerleyton, near Lowestoft, which much resembled in plumage the one lately obtained at Hampstead, in Norfolk, as recorded in the 'Zoologist' (Zool. 6325). This latter specimen was, I believe, shot by Mr. Gould, while on a visit to Sir Morton Peto, at Somerleyton.—*H. Stevenson; Norwich, February*, 1859.

The Jay a Bird of Prey.—As there are few recorded instances of this bird attacking and making prey of other birds, and having had the opportunity of witnessing this (supposed) rare fact, I think it worthy of being made a note of. About ten o'clock one morning, last March, I was looking into the garden from one of the windows of my house, and observing and hearing an unusual bustling and rustling among the branches of a tree, I soon perceived that a small bird was pursued by a larger one, when presently the lesser bird was struck down from the tree (shrieking and crying) to the ground, and was instantly followed by its unequal opponent, which seized the little bird in its claws and stood upon it, and was evidently exercising the muscular power of its talons, for the little bird kept up broken cries of alarm. The bigger bird very coolly gave a very systematic peck or dig with its bill into the body of the captive, then looked up and repeated the last-mentioned acts, with the same coolness and as systematically as before; the little bird at each thrust it received cried with convulsive ejaculations of distress, which grew fainter and fainter, until, as I suppose, for want of life, cried no more. My view of this butchering scene ended here, for the bird of might flew off with the body of the bird of lesser power. The smaller bird I did not satisfactorily determine the species, but it was the size of the titmouse (*P. cæruleus*), and I believe it to be that species. The large bird was the jay (*Corvus glandarius*). All authors agree that the jay is a "shy bird;" it, however, exhibited no symptoms of shyness on this occasion, for it was daringly impudent, carrying out his designs "right under my nose," and treated with unconcern (amounting to contempt) my uninterrupted "tapping at the window."—*J. J. Reading; Plymouth, January* 26, 1859.

Note on a new British Woodpecker.—The bird, which I describe, was shot by E. P. Cambridge, at Bloxworth Rectory, Dorset, December, 1836, from his bed-room window, as it crept amongst some low shrubs in one of the flower-beds on the lawn. We took it to be only a large and distinctly-marked specimen of Picus minor, noting especially at the time that it had more vivid red on the head and more white on the wings and back, and was larger than one or two other specimens of Picus minor which my brother had shot before; and I recollect well our hunting Bewick on the subject, and concluding that it might possibly be his "middle spotted woodpecker," but for the red on the head; however, the bird went to the stuffer's, and in due time came back labelled "least woodpecker, male adult." It was stuffed by Havell, at the Zoological Gallery, 77, Oxford Street, an establishment I know not how long since broken up and gone; from this time until April, 1855, the bird remained in my collection as "Picus minor," and was frequently seen, and by some experienced British ornithologists, but no one ever perceived that it was not Picus minor, until, in April, 1855, my friend, Mr. F. Bond, saw it was something strange almost as soon as he entered the room where it was, and taking it down, at once, with his usual acumen, pointed me out the distinctions from Picus minor. At my suggestion, he kindly took it and submitted it to the late Mr. Yarrell, who acknowledged its distinctness from Picus minor, but confessed himself ignorant of the species, and regretted that his last edition was either just out or had got too far on in the printer's hands to allow of its notice there: the examination of this bird was, I believe, almost one of the latest acts of Mr. Yarrell's life, and is very interesting. Shortly after this I made some notes of an American species in the Durham University Museum, labelled "Picus pubescens," and found them to agree in the main with my specimen; and since then it has been, until lately, in Mr. Bond's hands, waiting the examination and dictum of Mr. Gould. Mr. Gould examined it, and I cannot precisely understand what conclusion he came to, for all I heard of it was, that "he would like to see other specimens of the same species, from the same locality, before describing it. This would, doubtless, be highly satisfactory, but meanwhile (as getting these other specimens may take possibly some little time, seeing that it is now twenty-two years since this one was killed), I venture to request an insertion of this account and description, and hope any of the readers of the 'Zoologist' who possess British small spotted woodpeckers will compare their specimens, critically, with my description, as I consider it is not at all improbable that other British specimens exist and pass for Picus minor. As far as I can gather, from a desultory correspondence, neither Mr. Bond nor Mr. Gould were satisfied of its identity with Picus pubescens, though Mr. Bond considered it was nearer to that than to any other species. I have lately compared it with several American specimens of Picus pubescens, and also with a Scandinavian specimen of Picus minor, through the kind permission of the curator of the Derby Museum at Liverpool. The result of this comparison I subjoin to the description of my specimen, and, on the whole, after having also read carefully Audubon's descriptions of Picus pubescens and the allied species, and Cassin's observations on Picus pubescens, and the distinctive marks of American woodpeckers in general, I believe it to be identical with Picus pubescens (the downy woodpecker); still there is one main difference in it from all the specimens of Picus pubescens I have seen myself, and that is that mine has distinct black bars across the white on the back, while those had in no case the white on the back barred at all. Some other minor differences will be mentioned in the "distinctions from Picus pubescens." The description of my specimen is as follows:—

Length from tip of beak to tip of tail $6\frac{2}{3}$ in. Length of upper mandible $\frac{6}{10}$ in. Span of toes and claws $1\frac{3}{10}$ inch. Capistrum dirty white; bristly feathers projecting over the nostrils dirty white, mixed with blackish. Forehead broadly black. Top of the head crimson-red; the red extending quite to the nape of the neck, and meeting that and the upper part of the back, which are jet black. From the eye a broad black streak runs back, and, at the upper corner of its extremity, which is truncate, and wider than near the eye, it meets the crimson of the head and black part of the back, forming a continuation of the black forehead. From the corner of the mouth a blackish streak runs downwards, and dilates itself into a black patch beneath the point of the metacarpus of the closed wing. The space between these two black streaks is white, with a yellowish cast, and forms an L-shaped isolated marking. Between the crimson on the head and the black streak from the eye is also formed an isolated longish oval marking of white with a yellowish cast. The whole of the under side to the vent, inclusive, is dirty white, with a brownish yellow cast. Wings jet black; the lesser coverts tipped with pure white; the greater coverts, tertials and scapulars tipped and spotted with white; the primaries and secondaries tipped and spotted with white along the webs; all these white markings, when the wing is closed, form eight regular white bars (beside the white tips on the primaries); the first and second bars are formed by the tips on the lesser coverts and spots on greater coverts; the third by the tips on the greater coverts and spots on the tertials and scapulars; these three bars are curved; the fourth bar consists of spots on the outer webs of the primaries and secondaries; this bar (as well as all those of the next) is sharply angulated, and but little of it is seen in the closed wing, being hidden under the greater coverts and scapulars; the fifth, sixth and seventh bars consist of spots on the outer webs of the primaries and outer and inner webs and tips of the secondaries and on the scapulars; the eighth bar consists of three or four spots on the outer webs of the primaries and tip of the first secondary; the black intervals between these bars are all well marked, though of different widths; those between the three bars on the coverts being prettily and regularly vandyked. Back white, with a yellow cast, and barred with black. The two outer feathers of the tail on each side white, with one or two black markings; the next two black, with irregular white margins, and the middle feathers black; under side of the tail irregularly barred with black.

The main distinctions that I could trace between this bird and Picus minor are as follows:—First, the greater size, Picus minor being $5\frac{1}{2}$ to $5\frac{3}{4}$ in. long, only. Second, Picus minor has only five bars across the wings; three are across the primaries and secondaries and scapulars and two on the coverts; wanting entirely that on the lesser coverts nearest the shoulder, and the two nearest the tips of the primaries; also the black intervals in Picus minor are not vandyked, and all are more regular on the edge and in width more equal: Yarrell's description only gives four white bars, but he evidently overlooked that one which is almost hidden under the coverts and scapulars. Third, Picus minor has no black streak from the eye: this alone is sufficient to distinguish it at a glance; the red on the head in Picus minor is also much less vivid and does not reach so far down the nape of the neck.

The main distinctions between my specimen and those of P. pubescens, examined in the Liverpool Museum, appeared to me as follows:—Picus pubescens had only a narrow red occipital band, agreeing exactly with Audubon's figure and description. The value, however, of this distinction does not seem to be much, as we know that the immature males of Picus major have the head much suffused with crimson, while in adult birds it becomes merely a small patch at the occiput; and John Cassin ('Illustrations of Birds of North America,' published at Philadelphia, 1856), says "the young male of Picus pubescens has the head above entirely crimson; the adult, a narrow occipital band." Second, the back in Picus pubescens was pure white, without any trace of black bars, while mine is distinctly barred: Audubon makes no mention of black bars on the back. Third, the black stripe from the eye in Picus pubescens differs in commencing wider than the eye, swelling out in the centre and contracting gradually to the crimson band; while in my specimen it is narrowest by the eye, equal to the width of the eye only, and widens gradually, ending abruptly truncated. Fourth, the white bar nearest the shoulder in one specimen of Picus pubescens, examined, was hardly apparent, consisting only of a few confused spots, and not forming a distinct bar from the second bar; in another specimen, the development of this bar was more complete, but nothing like, in distinctness and regularity, my specimen, where the black interval is very clear. Fifth, Length of the two Picus pubescens examined, was 6¼ in., that of mine 6⅜ in.; Audubon's measurement 6¾ in.; widest span of toes and claws in Picus pubescens 1⅛ in.; in mine, 1$\frac{3}{10}$ in.; the bill of Picus pubescens was less robust than mine. Sixth, under parts of Picus pubescens much whiter than in mine, which are more like the under parts of Picus minor. A description in Audubon of a species he calls "Picus Gairdnerii" (which appears, however, to be only a variety of Picus pubescens) agreed with mine in the quantity of crimson on the head.

I have given these distinctions, minutely, more for the purpose of showing that I am of opinion myself that *my* bird *is* "Picus pubescens," than to try and show it to be *distinct.* Its distinctness from Picus minor is clear enough, and, but for the barred back, which may, however, be only the immature state, there appears but little in the above distinctions to justify its claim to a "species" of itself. My chief reason for wishing the above descriptions to be made known, is to get collectors to compare with them all their specimens of British small spotted woodpeckers, and also to get further descriptions of the true Picus pubescens. I have been minute in describing the shooting, &c. of my specimen, because it is necessary to be particular when a native of a foreign land is brought forth as an inhabitant of Britain, after having been killed so long.—*O. Pickard-Cambridge; Southport, Lancashire, February* 4, 1859.

A Hen catching a Mouse.—Whilst one of my brothers was out riding this morning, in passing a farmyard, he saw a barn-fowl (a hen) seize a mouse which was running into a stack, catch it in its beak, and throw it about a foot up into the air; this it repeated three or four times, letting it come on the ground each time; not being a naturalist, he did not stay to see the result, but he says it was in a very fair way of being killed. — *W. H. Leatham, Jun.,; Hemsworth Hall, near Pontefract, Yorkshire, February* 5, 1859.

Occurrence of the Little Bustard near Padstow. — A female little bustard was shot in a turnip-field very near the town of Padstow, in the early part of January last, and the fact was kindly communicated by C. G. P. Brune, Esq., of Prideaux Place, Padstow.—*Edward Hearle Rodd; Penzance, February* 10, 1859.

Birds Singing at Night. — On the night of Tuesday, the 18th ult., or rather the 25th, the moonlight was particularly strong, from the vertical position of the full moon. A friend of mine returned home late that night to his country residence, and a sudden violent gust of wind and rain overtook him on his way home. On his approaching a woody valley, where his residence lies, after the shower had passed away, between one and two o'clock in the morning, redbreasts and thrushes were in full song, principally redbreasts. It may be accounted for thus: the mornings in January had been very dark and sluggish; the gust of wind had probably awakened the birds, and, from the before-mentioned strong moonlight, they most likely thought it was daybreak.—*Id.*

Occurrence of the Black Swan on the South Coast.—Mr. Thomas Clark, in the 'Zoologist' (Zool. 6379), asks, respecting the black swans at North Moor, Bridgewater, Is it probable that they escaped from some preserve? The fact of the tameness mentioned appears to indicate a preserve, but in the 'Times,' of November 1st, 1855, the following may be read, which would establish the black swan as a British bird, if true:—"During the past week a bird of unusual size was observed flying towards Exmouth, on the Devonshire coast, from the sea. On arriving near land it wheeled round, and after flying back some distance, was seen through a glass to descend into the sea, near Straight Point. Two men immediately put off, and were fortunate enough to capture it. On examination, it turned out to be a black swan; it was poor in flesh, and evidently exhausted by long flight, but showed by its plumage and other indications that it had never been in captivity. It is supposed that by a long succession of storms it has been driven from the Pacific, its only known habitation." I remarked there had been very severe gales for some time past and made a note of it at the time.—*George Dawson Rowley; 5, Peel Terrace, Brighton, February* 12, 1859.

Occurrence of the Longtailed Duck on the Norfolk Coast.—In my last notice of winter arrivals on our coast I mentioned, as a not uncommon event, at this season, the capture of an immature specimen of Harelda glacialis, off Blakeney, the young birds of this species taking a far wider range, even in mild winter, than adults. I have now, however, to record the very unusual fact of five adult specimens of this truly Arctic duck having been recently killed on the sea-shore, at Winterton, near Yarmouth. The first of these birds, a male, in full winter-plumage, was shot on the 10th of January; the other two pairs, male and female, respectively between the 15th and 17th, and being sent up to Norwich for preservation I had an early opportunity of examining them. The females exhibited the usual sombre tints of the winter-plumage, and the males that rich contrast of colouring which makes them so conspicuous in collections. The one first killed was, if anything, the darkest on the breast, with scapulars more white than gray, but three finer specimens I never had the chance of handling. To what cause, accidental or otherwise, we are indebted for the appearance of these hardy visitors during this mildest of winters, is a matter of no little speculation. A season so unprofitable to the wild-fowl shooter I never remember, whilst the absence from our shores of themost common species would betoken no great amount of cold as yet in more northern regions. The long tailed ducks, however, according to Yarrell, are amongst the last to proceed southward, even in the most severe weather, "remaining as long as any surface of water continues unfrozen," and certainly, during the sharpest winters we have had within the last ten years, I have looked in vain for an adult Harelda in this country, amongst many rarities.—*H. Stevenson; Norwich, February,* 1859.

Occurrence of the Fulmar Petrel in Barnstaple.—On the afternoon of Wednesday, the 2nd of February, a strange sea-bird was observed flying low over the people's heads in the fish-market at Barnstaple, the fish-market being near the river (Taw). A violent gale from the N.W. had been blowing all day. The bird continued flying up and down the street for some little time, until at last it was shot from the street by some person who had gone for a gun. It was taken to the bird-stuffer in the town, where I saw it in the flesh, and found it to be a young bird of the fulmar petrel. It had, extraordinary to relate, an immense wen-like protuberance on the neck; this protuberance was the size of a small orange, perfectly spherical, and to a great extent nude of feathers; the skin of the bare part seemed hard and horny. The bird-stuffer skinned the bird while I was present, but was obliged first of all to remove the wen from the neck, which came off without much difficulty: the body of the bird was fleshy and well covered with fat; all its internal parts seemed healthy, and, from dissecting it, I found it to be a young male. The tumour which was removed from the neck weighed a trifle under three ounces, and, on making an incision in it, I found it composed of a firm, fleshy substance. It is probable that the bird must have been incommoded and weakened by this tumour, so as to have been unable to contend against the strong winds which drove it to a place so far south. A specimen of the longtailed duck was shot close to this town towards the end of last November: this is another bird not often obtained so far south as this.—*Murray A. Mathews; Raleigh, near Barnstaple, February* 5, 1859.

Occurrence of the Adult Glaucous Gull in Orkney.—The winter here has been very stormy, but unusually mild: I procured an adult specimen of the glaucous gull (*Larus glaucus*) on New Year's day; this is only the third adult specimen I have seen during my five years' residence at Stromness. We have seen two immature specimens this winter, but did not obtain either: some winters we have seen as many as half-a-dozen immature specimens.—*Robert Dunn; Stromness, Orkney, January* 24, 1859.

Interesting Fossil Bones in Philadelphia.—A remarkable exhibition of fossil bones was made by Mr. Foulke and Dr. Leidy, before the Academy of Natural Sciences, at a very full meeting, last evening, to which the attention of our readers is invited, because the new light which it shed upon, and the greatly enhancing interest it gave to, the common bone contents of the innumerable marl-pits of the Atlantic seaboard, make it, in a scientific light, the duty, and probably will make it the pleasure, of the intelligent and liberal-minded living in their vicinity to watch their periodical excavation, and secure still more valuable relics than any yet discovered. * * * * A month or two ago, according to Mr. Foulke's graphic historical exordium, he visited a neighbour's house, near his own summer residence at Haddonfield, in New Jersey, a few miles out from Camden, on the Camden and Atlantic Railroad; and, in the course of conversation, Mr. Hopkins described from memory some teeth and vertebræ which had been thrown out from a marl-pit on his property, not less than twenty years ago: one by one they had been given away to curious friends or casual acquaintances, or lost: he could remember no long or large bones, but only teeth and vertebræ. Receiving permission to re-open the spot, Mr. Foulke set a gang of marl-diggers to work at the bottom of a small ravine, near where it opens upon Cooper's Creek, and about twenty feet below the surrounding farm-land of the neighbourhood; three or four feet of soil brought the workmen to the face of the marl, and discovering the old digging, went down along its edge, six or seven feet, through a small bed of shells, to where the bones had been exhumed; and here, sure enough, were the rest of them untouched; a hind thigh-bone 40 inches long, a shin-bone 35 inches long, a splint-bone to match, an arm-bone 19 inches long, with one of the fore arm-bones to match, dozens of vertebræ, neck, back and tail, huge masses of the pelvis and shoulder-blade, some few bones of the foot or toe-joints, and a tooth,—all lying upon a second bed of shells: as the teeth were all-important and were liable to be disturbed, the soil of the pit was re-dug and carefully examined, and with great success. When Dr. Leidy was informed of the discovery, he and some other Members of the Academy, Mr. Lea and Dr. Le Coute among them, saw nothing in it but the common occurrence of Mastodon or mammoth bones entombed in an ancient bog. On going to the rooms, to which they had been with care conveyed, he recognised at a glance the evidences of their reptilian character: since then, weeks of patient adjustment and study have resulted in the noble lecture which he gave us last evening upon the Hadrosaurus Foulki of the green sand of America. He first enumerated the indications of reptilian form; the thigh-bone ossified, not like the mammals, from half-a-dozen centres, but from one single centre, as in the iguana, alligator, &c., and furrowed at the ends with the large blood-vessels of reptile-joints, instead of being smooth as in all mammalians. The whole form of the bones was different, and the vertebræ of the tail were armed above with the backward-leaning processes, and below with the loosely-shaped and likewise backward-leaning spines, which characterize the powerful, long, thin, deep reptilian tail. The teeth were also reptilian, and not carnivorous, like the crocodile's, but herbivorous, like the iguana's, and most curiously shaped and set. The creature was evidently of unimagined dimensions; its hind leg bones, when put together, would reach seven feet, upon which the pelvis and back-bone and upper skin would still go on, making it nine or ten feet upon the haunches: on the contrary, the fore legs were so disproportionately short that, had they been found at a different time or in a different place, no anatomist would have hesitated to assign them to animals of different kinds, or at least to different individuals; but the animal which this one most resembles, discovered in an English rock of the same age by Dr. Mantell, shows the fore and hind legs equally dissimilar. The fact, no doubt, is, that we have here the relics of a kangaroo-like alligator, of more than mammoth size, living near the great tertiary rivers and lagoons, and feeding on the vegetation, as it sat erect on its vast hind legs, supported by its tail. To get at its length, Dr. Leidy took the number of neck and back vertebræ common to all kinds of reptiles, and averaged the number of tail vertebræ between the hundred in a tail of the iguana and the twenty or thirty in the tail of the crocodile, and thus fixed the probable length of the whole creature at twenty-five feet; its tail must have been three feet deep, its neck thin, and its head no doubt small; its teeth are but two inches long, but set in such a tessellated wall around the mouth as to make a formidable cutting and grinding apparatus. * * * * The enormous size of this creature was exposed by a comparison of its thigh-bone with one of a mammoth in the Academy collection, only two-thirds as long; but what was the astonishment felt to see the Doctor lift from the table a fragment of a thigh-bone nearly half as long again, describing its reception some years ago from the same district, and its being stowed away as an uncharacteristic, and therefore, for the time being, a worthless specimen, since there were no more perfect bones of the same shape with which to compare it and determine its relations. This is one of many examples constantly afforded by collections, of the possible future value of all objects of Natural History, when properly labelled and arranged. Some happy accident is sure to come to the relief of the most helpless of fossils, the most shapeless of fragments. * * * * The family must have been very extensive, for Dr. Leidy is now able to recognise its representation by some before enigmatical fragments from Nebraska and from the Lower Mississippi: the formation, we know, extended across the Continent, because its shells are found from Mexico to the Arctic Sea, and on Vancouver's Island. At the time this Haddonfield individual browsed in the Valley of the Delaware,—for of course he did not live at Haddonfield, at that time many fathoms under sea,—the Gulf Stream passed up the immense strait or narrow tertiary ocean, bounded on the east by the rocks of Missouri, Iowa and Lake Superior, and on the west by the Rocky Mountains, into the Northern Sea. The climate of the Delaware was at that time deprived of its present equatorial winds from the south-east, but was equally well secured from the north-westers, which come out from the centre of the British possessions. The average cold was no doubt greater, but the variation less severe. England was then as damp as now, but much colder, and the mountains of Scotland were covered with ice and snow; yet the Iguanodon, cousin of the Hadrosaurus, found himself comfortable there. As whales can exist in every zone of latitude, as mammoths and elephants once lived on the shores of the Siberian Circumpolar Sea, as well as in the jungles of India, so no doubt these gigantic two-legged saurians made their earthquaking hops as friskly in cold and heat, whenever the continental rivers ran strong and the ocean shore was near.—*Friends' Intelligencer, December* 17, 1858.

Is the Mud-Fish a Fish or an Amphibian?

By Edward Newman.*

It cannot but appear strange to those experts in Natural History, who may chance to be unacquainted with the mud-fish, that there should exist any animal of large size and clearly pronounced form, which when dead has undergone the anatomical scrutiny of an Owen, and when living has been exposed to the observation of a hundred well-instructed eyes, yet concerning which doubts exist as to its amphibious or ichthyac character. Such, however, is the case, and if by chance, in conversation, we meet with any one who doubts or contravenes the assertion, we shall find on inquiry that he has adopted without examining the ichthyac or amphibian hypothesis by the simple process of pinning his faith on another man's sleeve, has saved himself the trouble of thinking at all by adopting implicitly the thoughts of another. One man will say, "Oh, that question has long been settled: Fitzinger has proved it an amphibian; you should read him." Another will assert, "There is do doubt *now:* Owen has dissected it, and proved it a fish: you must study his paper; it is quite conclusive." I have been told a hundred times over this story of the affair being "settled," but two successive informants have rarely admitted the same mode of settlement, and it therefore appears perfectly legitimate for the truth-seeker to reopen the question and consider the subject *de novo*. And here, in the very outset, I cannot too distinctly disclaim any knowledge of the internal structure of the animal beyond that which I find in Professor Owen's invaluable memoir: in common with other naturalists, I regard that great anatomist's definitions of the structure of the mud-fish as all that can be desired; difference of opinion as to its icthyac character originates in the inferences drawn from acknowledged facts. One character alone has been the subject of discussion and doubt, and to this I shall briefly allude hereafter.

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The genus Lepidosiren was founded by Fitzinger, in Weigmann's 'Archiv' for 1837, on two specimens of an animal discovered by Dr. Natterer in South America: one of these was found in a swamp on the left of the Amazon, about Villa Nuovo, the other in a pond near Borba, on the river Madeira, a tributary of the Amazon. Fitzinger unhesitatingly accepted the four tendril-like processes attached to the ventral surface of the animal as legs, and hence concluded the creature was amphibian, but of a new and uncharacterized family. The species was named L. paradoxa, a name expressing the author's difficulty in reconciling its conflicting affinities. The genus was re-described by Professor Owen, in the 'Transactions of the Linnean Society,' in 1840. The species, differing essentially from Natterer's, is a native of the Old World, was taken in the river Gambia, and presented to the Royal College of Surgeons, in 1837, by Mr. Thomas C. B. Weir, together with a smaller dried specimen in indurated clay, baked hard by the sun. The new species was called L. annectens: it is perfectly distinct from L. paradoxa, having a less elongate form and only thirty-six pairs of ribs, whereas the South American species has no less than fifty-six.

Living specimens of L. annectens were imported from Western Africa in 1856, and exhibited in the Crystal Palace: we have two published accounts of them; the first by Mr. Waterhouse Hawkins, in the 'Illustrated London News' for September 20, of that year, and the second by Mr. Bartlett, in the illustrated 'Proceedings of the Zoological Society' for the same year, at p. 346. This latter is included in a paper by Dr. Gray, intituled "Observations on a living African

Lepidosiren in the Crystal Palace." I select Mr. Bartlett's communication for reprinting, because it not only comprises the main facts noticed by Mr. Hawkins, but gives additional matter of much interest.

"In June last," says Mr. Bartlett, "I received from Western Africa a case containing four specimens of this animal. Each specimen was imbedded in a block of dry, hard, muddy clay, about the size of a quartern loaf; these blocks of clay were each sewn up in a piece of canvas to prevent the clay crumbling or falling to pieces. According to the instruction I received from Captain Chamberlayne, the gentleman who sent them, I placed them in a tank of fresh water, at the temperature of 83 degrees; in doing this a portion of the clay crumbled off one of them, and partly exposed the case in which the animal was contained; I was watching the operation when suddenly the case or cocoon rose to the surface of the water. I at first thought the animal contained in it must be dead, but I shortly afterwards observed a slight motion: apparently the animal was endeavouring to extricate itself, and this it soon afterwards accomplished by breaking through the side of its tough covering: it swam about immediately, and by diving into the mud and clay, which by this time had become softened, rendered it difficult to make further observations. I removed the case or cocoon, which still floated. On the following morning I found that two more of the animals had made their appearance, their cases, however, were not to be seen; they evidently remained imbedded in the soft clay. In the course of the next day the fourth animal suddenly floated to the surface, enveloped in its case; as it showed no signs of life I removed it, and found the animal had been dead some time, as it was much decomposed. At the time these animals first made their appearance they were very thin, and about nine inches long; they began to feed immediately upon earth-worms, small frogs, fish, &c., occasionally taking raw flesh. I saw them sometimes attack each other; and one of them (I imagine in endeavouring to escape) leaped out of the tank into the large basin in the Crystal Palace in which the tank was standing, and is still at large among the water-lilies, &c. The remaining two lived together for some time, apparently on good terms; but, in the month of August, the one now remaining in the tank seized its companion and devoured nearly half of it, leaving only the head and about half the length of its body. In feeding, this creature masticates its food much, frequently putting it forward almost quite out of its mouth and then gradually chewing it back again, and often (when fed upon raw flesh), after having so chewed it for some time, it will throw it out altogether. The growth of these animals is most extraordinary; in June, as I have before stated, they were about nine inches long: in three months they attained their present size, which cannot be less than eighteen inches in length. It rises frequently perpendicularly to the surface to breathe, and at other times it supports itself on its fin-like appendages, and, with the aid of its tail, raises its body from the ground, the fins being bent or curved backwards. The movement of this animal is generally very slow, and would give one the idea that it was very sluggish; this, however, I have good reason to know is not the case, as in attempting to capture the one at liberty in the large basin it darted away with the rapidity of an arrow. I have reason also to believe the animal finds its food as much by scent as by sight. With reference to the cocoon, the end covering the nose of the animal is rather pointed, and has an aperture about the size of a pin's head, which I have no doubt enables the animal to breathe through during its state of torpor. The animal, when in its case, is coiled nearly twice round, and I observed in each of the blocks of clay a small hole about the size of a mouse-hole, which was quite smooth on the inside, as though the animal had crept through it."

Dr. Gray, to whom this admirable letter of Mr. Bartlett's is addressed, publishes the following additional particulars, and apparently from actual observation:—"The mouth is firmly closed by the overhanging upper lip, except in front, where there is a small oblong transverse horizontal opening on the outer edge of the lips, admitting the water to the small open external nostrils, which are on the middle of the under side of the upper lip. This opening does not extend to the hinder part of the lips, which are closed behind it, so that water cannot enter the mouth in that direction, except through the nostrils. In this quiescent state the lateral gill-opening is generally closed, but sometimes it is slightly elevated, and a small current appears to be emitted now and then from it, as if a small quantity of water were taken in by the nostrils and emitted by the gill-flap; but this action is not continuous nor very distinctly visible. While remaining under the water the animal sometimes opens the mouth to its full extent, leaving it open for some time, dilating the throat by the action of the os hyoides; when fully dilated it closes its mouth, opens the gill-aperture, and, contracting the throat, emits a strong current of water through the lateral gill-aperture. It occasionally, but at uncertain periods, rises perpendicularly to the top of the water, until the front part of the head and the whole mouth are exposed above the water; it then opens its mouth, which it retains open for a time, dilates its throat, as if taking in all the air it can contain, closes the mouth, descends under the surface and contracts it throat, as if it were forcing the air into the lungs: sometimes during this action one or two very small bubbles of air are emitted at the gill-aperture, and then the animal takes up its old position near the bottom of the vase. I once saw the animal ascend, and so take in air almost immediately after it had been passing a fresh supply of water to its gills: when I have been observing it, it appeared to take in air more frequently than water. It often rises with its body perpendicular, as if it were going to take in free air, but descends without reaching the surface of the water."

I will now give some account of my own interviews with the mud-fish. These interviews were three in number, and I had the opportunity of examining the creature under two different aspects: on the occasion of one visit, the second, he continually came to the surface, holding his body at an angle of about 45°, keeping his four tendrils in constant and graceful undulation, and frequently opening his mouth, apparently for the purpose of breathing atmospheric air. Although, however, this action was frequently repeated, an idea occurred to me that he might have some other business in hand than merely satisfying his spectators as to what class of endosteate animals he belongs; because I observed that the gold fishes in his immediate neighbourhood were also hanging from the surface of the water at a similar angle, were also smacking their lips, and were also apparently bent on inhaling atmospheric air. This, instead of inducing me to speculate on the exact site occupied by the mud-fish in the System of Nature, led me to advise the officer on duty to change the water, concluding that mud-fish and gold-fish had combined together to exhaust the oxygen of the small allowance of water in which they were confined. Be this as it may, it is quite clear, that whatever conclusions are drawn from the fact, that one fish in a tank appears to seek a supply of atmospheric air, must be applicable to a second, and a third, and a fourth fish, which, under precisely identical circumstances, seek the same means of supporting life. Thus it appears to me that the observations of Mr. Waterhouse Hawkins, Mr. Bartlett and Dr. Gray, coinciding as they do most precisely with my own, go simply to prove that fishes, having exhausted the oxygen of the small portion of water allowed them, seek to obtain that element of existence from the atmospheric air. On the occasion of my other visits, the conduct of the mud-fish was widely different; he kept constantly below the surface, and, with a sort of unhealthy restlessness, perambulated his prison like a caged tiger; still the movements were free and unfettered; and the involuntary functions of breathing, &c., may be supposed to have been performed in a somewhat natural manner. The first character in this function that struck me as worthy of comment was the extreme regularity of the rythmical inspirations. I had not the opportunity, on either occasion of observing the fish during anything like an entire minute; its motion was incessant, but I marked the internals of inspiration by a watch, and although, in many instances, the observation extended to but three inspirations the measurable recurrence of the act was established beyond a doubt; the conclusion resulting from observations made during twelve consecutive minutes being, that the creature inspired water thirty-one times per minute. On the occasion of another visit, a second set of observations was made with equal care, and a somewhat different result obtained, the average number of inspirations being thirty-three per minute: hence it must be admitted that, in a state of confinement, in a limited quantity of water, and with an atmosphere heated to 70° Fahr., the mud-fish breathes once in two seconds, and it may be inferred from the vigour and activity displayed by the animal, and from its enormous increase in size, that this rate is that of health, and not the result of peculiar circumstances. These inspirations differed very considerably from those of the gold-fish, inasmuch as the interior fleshy substance contained between the rami of the lower jaw rose after each inspiration, and being pressed against the palate, entirely precluded the return of the water through the mouth. This mode of breathing I subsequently found was that of the Esocidæ, and is beautifully exemplified by a pike in one of the tanks at the Zoological Gardens. His extreme quiescence greatly facilitates the observation. I failed to observe the characters of the external aperture, or gill-opening, but of the existence of such an aperture there could be no doubt, for I saw, after every third or fourth inspiration, a number of minute bubbles, having exactly the appearance of globules of quicksilver, escape in front of the anterior tendril, and ascending to the surface of the water there become amalgamated with the atmospheric air: the number of these globules was usually five or six, sometimes seven or eight: one or two were always larger than the rest, but still minute, and likely to escape the notice of a hasty or superficial observer. During the two visits the creature never once ascended to the surface, but frequently ascended almost perpendicularly towards the surface, and before reaching it altered his course and turned downwards among the weeds: this observation, probably made prior to Dr. Gray's, is exactly corroborated by him. "It often rises with its body perpendicular," writes Dr. Gray, "as if it were going to take in free air, but descends again without reaching the surface of the water." This action would perhaps, in some minds, induce the conclusion that the alteration of course proceeded from the fear of coming in contact with atmospheric air, but the action is so common among fishes, both in aquariums and ponds, that it simply proves that the mud-fish has, in this respect, the normal habits of a fish. The curious position in which the creature is figured in the 'Proceedings of the Zoological Society' I had not the good fortune to observe. It seems to be walking on its tendrils, and to be taking an enormous stride with the hind pair: Dr. Gray does not, however, describe this mode of progression. The creature, in the passage I have cited, is described as simply resting on these tendrils at the bottom of the tank, but this resting seems scarcely requisite in a creature whose specific gravity is exactly equal to that of water. It is, however, worthy of observation that this seeming habit of resting on the four extremities is constantly observed in fishes and some even use their extremities for terrestrial progression, a fact noticed by Dr. Gray. There is then no single act, as far as yet observed, of the mud-fish that indicates an amphibian rather than an ichthyac character. The ascertained fact of its imbedding itself in clay, and the supposed fact that it passes from river to river by some overland route are equally susceptible of parallels among undoubted fishes: of this there are many instances, but I prefer one already cited by Dr. Gray from the 'Zoological Journal.' Dr. Hancock observes "When the water is leaving the pools in which they commonly reside; the yarrow (a species of *Esox*, Linn.), as well as the round-headed hassar (*Callichthys littoralis*) bury themselves in the mud, while all other fishes perish for want of their natural element, or are picked up by rapacious birds. The flat-headed hassar (*Doras costata*), on the contrary, simultaneously quits the place and marches overland in search of water, travelling for a whole night, as is asserted by the Indians, in search of their object. I have ascertained by trial that they will live many hours out of water, even when exposed to the sun's rays. Their motion overland is described to be somewhat like that of a two-polled lizard: they project themselves forward on their bony arms by the elastic spring of the tail exserted sideways; their progress is nearly as fast as a man will leisurely walk."

Again, I would invite those who are familiar with fishes and the more common amphibians to pay particular attention to the habit, so particularly emphasized by Messrs. Bartlett and Hawkins, of dashing or darting through the water; the very expressions indicate the movements of a fish, not of a reptile; and if we institute a comparison, in this respect, between the mud-fish and those lethargic amphibians, with which it has been more especially associated, the contrast becomes still more striking.

From the actions of the living animal, let us now proceed to consider its structure. In the first place, the limbs of all reptiles, including the batrachians, are used as levers for propelling forwards a body which rests on the ground; hence there is always a prominent elbow giving to the creature a most ungainly aspect in walking: now the limbs of the Lepidosiren are represented as being used as perpendicular props to support the body clear of the ground when at rest in the water. We can have no reason whatever to doubt the accuracy of the observations I have cited or the beautiful drawing of Mr. Ford, but we cannot fail to observe, that the action and position thus described and indicated, are those of a fish, not those of a reptile. We must also consider what is the composition of these tendrils: each is composed of a single bone clothed with skin, which throughout its length is produced into a thin membranous wing, the bone itself being composed of from thirty to forty minute joints, exactly similar to those which constitute the soft rays of malocopterygian fishes, and totally different from the bones which compose the limbs of amphibious or oviporous animals.

A second external character of importance is, the position of the nostrils; these are placed on the under side of a slightly projecting snout, as in the cartilaginous fishes, and not all in front, as in the amphibians: the very important question, whether these nostrils are olfactory organs, mere blind sacs as in fishes, or respiratory organs communicating with lungs, as in reptiles, has yet to be decided. Professor Owen, after the most elaborately careful dissection, declares them blind sacs; and the living animal proves they are olfactory organs of great power, since, as Mr. Bartlett and all other observers declare the animal seeks its food by scent, and not by sight. Dr. Gray, but apparently without having made the dissection, states that each nostril has an opening within the mouth, and that a probe may be passed from the external to the internal opening. In this instance I cannot courteously discard either assertion; but it must at once strike the naturalist that one or other of the statements is erroneous, and the tendency will be to agree with that which is based on dissection, and which corresponds with every act of the living animal. Dr. Gray's belief that the mud-fish respires through its nostrils is supported by another assertion, that the creature has "two well-developed cellular lungs of nearly equal size. (See Owen, Trans. Linn. Soc. vol. xviii. plate 25, fig. 3, plate 26, fig. 1, 2.)"

Nothing can be more candid than the way in which Dr. Gray here gives chapter and verse for the assertion he has made, and no authority can be higher than that which he quotes. All that can be required of a naturalist is thus to refer to the source of his information, and, making the required reference, we find Professor Owen using the following words:—"The lungs, for I know not how otherwise to designate, according either to their physiological or morphological relations, those organs, which in the technical language of the ichthyologist, would be termed the swim- or air-bladder." Here then we find the only authority for the well-developed lungs, carefully explaining in parenthesis that he applies that term for want of a better to that very familiar organ, the swimming bladder. Now this conversion of the swimming bladder of fishes into a lung-like organ is an abnormal, but by no means uncommon, character in fishes, and has attracted the attention and consideration of all our ichthyologists. Cuvier, and in ichthyology we cannot have a higher authority, has particularly noticed this fact in the genus Amia, also an inhabitant of rivers: of this genus, he says, at p. 327 of the second volume of the 'Règne Animal,' that the swim-bladder is cellular, like the lung of a reptile; the fact would appear to be that the swim-bladder of fishes is in some measure the representative of a lung, and, like the lung, can be voluntarily inflated: the walls of this organ in Amia and Lepidosiren become incrassated and cellular, and certainly in this state represent the lung; but it is not allowable to take this as evidence of the reptilian nature of the mud-fish, unless we make the application of the theory universal, and thus transfer a perfectly normal malacopterygian, which Amia certainly is, to the class of reptiles also. The mud-fish is acknowledged on all hands to possess a perfect apparatus for breathing water; it has exactly those proper fish-gills which are the characteristic of fishes; and although the external opening is small, this character simply indicates an approach to the viviparous, rather than the spawning fishes.

The next structural character to which I wish to invite attention is, the dermal envelope; this it will be seen is completely covered with scales exactly like those of a fish, and on these scales is a lateral line as distinctly and strongly pronounced as in the most typical of the spawning fishes. Dr. Gray, naturally anxious, of course, to explain away so decidedly an ichthyac character as the possession of a lateral line, which had previously been pointed out by M. Dumeril, and also by myself in a paper read before the Linnean Society, makes use of the following words:—"Authors have laid great stress on the fact of its being provided with a lateral line, overlooking the fact that the common eft (*Triton cristatus*) has similar lines on both the sides and head." Now, has not Dr. Gray overlooked the fact that the lateral line of fishes is on the external surface of the scales, and that amphibians being destitute of scales cannot by any possibility possess the true ichthyac lateral line? Dwelling for another moment on the very complete armature of scales with which the mud-fish is covered, it must be remarked that this character alone is quite sufficient to separate it from the Amphibia, which are, without exception, totally destitute of scales; indeed, almost every naturalist has made this a leading character in distinguishing the spawning from the oviparous reptiles: the possession of scales, and the lateral line on those scales, are both of them unmistakeable proofs that Lepidosiren is a fish, and not an amphibian.

Lastly, let us make a transverse section of the body of the mud-fish, and we find its vertical diameter incomparably the greater as in fishes, while in reptiles, including the amphibians, a contrary character obtains, the transverse diameter being invariably greatest. I think that no attempt can be made to associate the mud-fish with the isogenous, oviparous or scaly reptiles, because the only reptilian character it possesses are those of the true amphibians; indeed no one has assumed the existence of any affinity between the mud-fish and the oviparous reptiles. Allow me then to recapitulate the characters in which it differs from the amphibians.

1st. Its rythmical breathing and its mode of taking atmospheric air at the surface of water, when the oxygen of the water in which it has been kept is exhausted.
2nd. Its velocity in swimming, as particularly pointed out by Mr. Hawkins and Mr. Bartlett.
3rd. Its mode of eating.
4th. The composition of, as well as the mode of using, its four extremities.
5th. Its scaly covering and lateral line.
6th. The greater diameter of a vertical section of its body compared with a transverse section.

These six characters appear to afford conclusive evidence that Lepidosiren is a fish, and not a reptile.

But if we find the true or normal characters of a class thus, as it were, dying out, and the more obvious and positive distinctions utterly failing, shall we not conclude that one class thus gradually merges in another exactly in the same way that a species has lately been said to have no precise or definite limits? I cannot admit the position in either case, or the validity of the reasoning that thus breaks down the barriers which nature appears to have set up. How numerous are the opinions on record that the ornithorhynchus is something intermediate between a suckler and a bird, and that it obliterates the line of demarcation between the two. I cannot think so: I believe in Nature's barriers, and I regard the difference from what is called a type as the simple and inevitable consequence of diversity in structure; in fact it is but another mode of expressing a self-evident truism. The Lamarckian hypothesis would, I suppose, regard the ornithorhynchus as a suckler struggling to become a bird, the mud-fish a reptile struggling to become a fish. All that I can see in these creatures is that they are forms to which we are unaccustomed: had our knowledge of their respective classes commenced with these two, and had the perch and the monkey been the recently discovered rarities, we should have experienced precisely similar difficulties in associating them with the mud-fishes and water-moles. The belief in connecting links appears to be gradually fading under the light of elaborate investigation; superficial similarities, as that of a bat to a bird, a whale to a fish, a pangolin to a lizard, have their own signification and teaching, but the more carefully these forms are investigated the more palpable does it become that the distinctions philosophers have laid down are absolute discoveries of what has always existed, not the mere creations of the brain. In Entomology the multitude of species enables us to see this more clearly: for instance the coleopterous type of structure gradually fades away, becoming less and less pronounced at a variety of points, but still the beetle is to be traced; we found it nowhere so altered or depauperated as to be mistaken for a member of some other division of the world of insects. And thus the seemingly paradoxical mud-fish is still a fish, although so reptilian in its superficial aspect as to have induced such conflicting opinions.

The remaining mud-fish at the Crystal Palace finally fell a prey to that fatal disease of fishes, so well-known as the fungus: at first the extremely minute filaments protruded about the base of the anterior tendrils, but after a time the whole surface of the body was covered, as in an envelope of mould. Thus, even in its death, the creature proclaimed its ichthyac character.

EDWARD NEWMAN.

An Acarus injurious to Orchids.—For several years past the beautiful tribe of Orchids cultivated in this country have been troubled with what has been termed the "Orchid disease." No one knew the cause of this so-called disease, or its cure: about twelve months ago it was very bad in several valuable collections of these plants; it was then recommended to place the plants in a drier atmosphere and give them a higher degree of temperature; this was certainly beneficial, but it did not indicate the cause. The drier atmosphere dried up the decaying tissues of the leaves, caused by the puncturing of the insect I am about to describe: this left the leaves full of brown blotches, which of course very much impaired the functions of the plants, not to mention the unsightly appearance. About the 16th of January I was shown what appears to be the cause of this disease; several plants had been observed to be what is called "going wrong:" this led to the investigation of them with a lens; the little Acari were then detected busily engaged in their work of destruction, puncturing the leaves with their beak-like nostrums and sucking out the vital juices of the leaves. As soon as they have sucked out their food from one part they move on to another more healthy portion of the leaf; they are not to be found where there is decay or the leaf has been drained of its vital fluid, which shows that these creatures have nothing to do with the decay of the leaves,—that is, they are not attracted by the decaying vegetable tissues, but feed on the healthy sap. This apterologous creature appears to be undescribed: it is undoubtedly an East Indian species, and has been imported with the plants on which it feeds. The following is a description of it, and I have called it

ACARUS ORCHIDARUM.

A. rubro-miniatus, dorso nigro bilineato curvato, ovato-ellipticus antice acuminatus, postice elongato-obtusus, depressus, subtillissime corrugatus, marginibus pubescentibus striatis, disco in mare carinato, pedibus rufescentibus pallidioribus articulis subspinosis. ¼—⅓ lin.

Ovato-elliptical, depressed; the back of the male running up into a strong keel or dorsal ridge; the female is without it. The body striated and flattened on the margin, so as to admit of the creature adhering closely to the leaves, similar to a female Coccus; the margin finely pubescent. The male is of a vermilion-red colour and marked on the back with a black line, which encloses a fiddle-shaped space. The female is paler and rather larger, being of a yellower colour; the lines on the back irregular and broken into dots; the dorsal ridge obsolete; the legs pale reddish yellow; the articulations set with spines.—*Edward Parfitt; 4, Weirfield Place, St. Leonards, Exeter, February 7, 1859.*

Occurrence of Vanessa Antiopa at Torquay.—A very fine specimen of Vanessa Antiopa occurred here on the 26th of December last; it had settled on an iron railing in the town, and allowed my brother, who discovered it, to approach quite close: this is the second met with here this season, my father having seen another in September, on the wing.—*H. W. Battersby.*

Food-plant of the Genus Acronycta.—In the 'Zoologist' (Zool. 6382), I find the Rev. H. Harpur Crewe doubts the larva of A. Ligustri feeding upon privet; but that it does so, the following facts will prove. While collecting in the lane that leads from Greenhithe to Darenth Wood, a few years since, I found a long slender green looper on privet, which spun up on the 25th of August, and on the 22nd of September produced a fine female of A. fuscantaria. As this larva was new to me, I endeavoured to procure others, and in beating along the hedge I obtained from privet several fat green larvæ, slightly hairy, the hair hardly perceptible, unless held against the light; these produced A. Ligustri the following May and June. I have also frequently beaten them from ash, but as this food dries up very soon when put into the breeding-cage, I invariably give them privet, upon which they thrive equally well. In September last, I obtained the beautiful larva of A. tridens, respectively from sallow, birch and oak.—*William Machin; 35, William Street, Globe Fields, Mile End, London, January* 5, 1859.

Food-plant of Acronycta Ligustri.—I hasten to acknowledge myself in error, in doubting (Zool. 6382) whether the larva of A. Ligustri ever fed upon privet. Mr. Doubleday kindly informs me that he has for years past been in the habit of taking it upon a privet-hedge in his garden.—*H. Harpur Crewe; Drinkstone, Woolpit, Suffolk, February* 7, 1859.

Note on Tephrosia crepuscularia and T. laricaria.—It is a very odd thing that if these two insects be, as Mr. Gregson supposes, the same species, they should so regularly occur at different periods of the year. Neither species is very uncommon in some parts of Hampshire, and when staying with my friend, Mr. Hawker, I have had some opportunity of becoming acquainted with their habits. Tephrosia laricaria begins to appear in March, and continues through the greater part of April. We never saw a specimen of T. crepuscularia before the beginning of May, when not a single T. laricaria was to be seen. I am well acquainted with the larva of T. crepuscularia, having both taken it on sallow and aspen, and reared it from the egg. I have tried, but could not succeed in getting the females of T. laricaria to lay eggs. Breeding both species from the egg is of course the only way to settle the question satisfactorily, and this I am happy to know is likely to take place during the present season. The exhibition of a long series of varieties of either insect amounts to nothing. Mr. Gregson might just as well take a long row of Acronycta Psi and A. tridens, and, because the members of the Northern Entomological Society could not distinguish one species from the other, endeavour to prove them identical. —*Id.*

Observations on the Solenobiæ of Lancashire, &c.—Herewith I send, for your examination, six bred male specimens of Solenobia inconspicuella and a card with females and cases, also seven males of my S. triquetrella (partly bred) and three females and cases. I think, if you will refer to Bruand's work, you will satisfy yourself that these are really identical with the species he describes as S. triquetrella: it is impossible to make anything out of the plates representing the males of S. inconspicuella and S. triquetrella. The cases of S. inconspicuella are found here on beech trees in Prestwich Wood, and the moths appear early in April, and are most sluggish creatures. The cases of S. triquetrella are found on large millstone-grit stones on the moors (occasionally on stone walls); in order to get them it is necessary to turn over these big stones (not a very easy job, by the way), as these little rascals prefer the sides nearest the ground. These insects appear in the perfect state from the 1st to the 20th of May, and are very active on the wing, and, what is very singular in this genus, one rarely gets a female. The female chrysalis is seen projecting from the case,—the insect is missing; whether its economy is different from that of S. inconspicuella, or they become a prey to spiders, Coleoptera, &c., I know not: what females I possess are chiefly bred: the anal aperture in the female is considerably less woolly than in S. inconspicuella. These Solenobiæ are a very difficult group: it is impossible to know much about them without a deal of attention to their habits; but if my insect is not the true S. triquetrella, depend upon it is a new species. The cases found on granite rocks in North Wales may some time or other be bred. Another species occurs in extraordinary numbers on an old limestone (I think) wall between Conway and Llandudno; it is like none that I know of: I bred an apterous female out of a lot of three cases (that I thought were not going to produce anything), and it was of a yellowish colour and exceedingly active on its legs. Again, on some fir trees in the centre of a large wood at Rudheath, Cheshire, I met with some twenty cases, from which I bred a single female. Then there are cases on beech trees which I find at Dunham Park; for years these only produced females: these larvæ take two years to arrive at perfection. I send some of these larvæ by the post for your artist to figure, and I will shortly send you some larvæ of S. inconspicuella, from beech trees at Prestwich, which regularly produce both sexes every year, and afterwards you shall have some of the millstone-grit larvæ, so that you can compare all three together. Perhaps between us we shall throw a little light on the subject. It is very odd how this group is neglected by collectors generally: I am sure if they were systematically worked a good many species would turn up.—*R. S. Edleston; Bowdon, near Manchester, January* 17, 1859. [We are extremely obliged to Mr. Edleston for the above valuable communication. On a close scrutiny of the insects sent, and a comparison with Bruand's work, we have come to the conclusion that the S. triquetrella of that author is, in point of fact, our S. inconspicuella (the S. triquetrella of the German authors being a larger, darker insect), and we cannot ourselves distinguish the S. triquetrella of Mr. Edleston from his S. inconspicuella, individual specimens of the former differing more from one another than they do from S. inconspicuella. Indeed the result of this investigation has been greatly to shake our faith in the specific distinctness of S. Douglasii. The neuration of the hind wings of these insects varies to a very curious degree in the same species, two veins being either separate at their starting points, or starting from the same point, or even fused together for some distance, whereas, in one specimen we possess, one of these two veins has disappeared altogether! But we admit that the difference of habit and periods of appearance has great weight with us, and possibly the species which does not appear till May may be really distinct from the early April insect, S. inconspicuella. Time will show.—*H. T. Stainton.—Intelligencer.*]

Observations on Butalis grandipennis.—On the 19th inst., being well in advance of my printers, I resolved to open the campaign by visiting the classic ground of Wimbledon Common. My object was to try and obtain, either by inspection or beating, the larvæ of Coleophora albicosta; but either I was not at the precise spot frequented by that insect, or else the larvæ are not obtainable at this period of the year, for eyes and beating-stick were both used to no success, and no Coleophora larvæ rewarded my labours. Instead thereof I fell in with the larvæ of Butalis grandipennis, and wanting some of these to send abroad I proceeded to collect them very eagerly. The webs they make in the furze bushes are very conspicuous, but often very inaccessible; the larva likes to have its habitation where four or five branches start off from the main stem, and to obtain them you must cut the main stem below the web, and then proceed to tear off the branches *seriatim.* It is not possible to avoid pricking the fingers. When the web is thus laid bare, it is too opaque to allow of your seeing whether it is tenanted or not, and it must be cautiously removed from the stem and pulled to pieces; in this process the larvæ are eventually brought to light. I thus obtained between forty and fifty, and got a good notion of the creature's habits. It is a very artful little animal, and, though very often solitary, one sometimes meet with individuals so amiable that five or six will live harmoniously together. On two occasions I found that the larva, not satisfied with the natural protection of the web, had pressed a great coat into its service, in the form of an old seed-pod of the Ulex. The outer web is tolerably thick and fluffy-looking, but besides that, nearly every larva is separately enveloped in a white *robe de soie.* The creatures were all quite active, by no means torpid, but then it was a mild, spring-like day, and, with the thermometer above 50° and a light breeze from the south-west, torpidity was not to be expected. Owing to the dry season Wimbledon Common was far from being in its normal state; it was comfortable and clean walking, and the wet places were all dry! Genista anglica was putting forth its young green leaves, without any superfluous moisture at the roots of the plants. Thus I opened my season of 1859.—*H. T. Stainton; Mountsfield, Lewisham, January* 20, 1859.

Occurrence of Psyche roboricolella, P. salicolella and P. tabulella in Britain.—I lately forwarded to Mr. Henry Doubleday specimens of some Psychidæ which were unknown to me, and he has kindly informed me that they are the following species:—P. roboricolella, *Bruand* (No. 72).—I bred a male of this insect on the 26th of last June, and two or three females a few days after. The cases, which were similar to those of P. nitidella, *Steph.*, I found at West Wickham, on birch, the early part of the same month. This species may be distinguished from P. nitidella, *Steph.* (P. intermediella, *Bruand*) by the wings in the male being rounder and much blacker than in the male of P. nitidella, and the female of P. roboricolella has the anal tuft of hair entirely white. P. salicolella, *Bruand* (No. 74).—I bred a male and female of this species on the 23rd of June last, from two cases that I found about a week previously, near Hampstead, on buckthorn. The wings in the male of this insect are black, but longer and narrower than those of P. roboricolella. The case is very different, being covered over with pieces of bark, and is similar to that of P. fusca, but only a third of the size. P. tabulella, *Bruand* (No. 75).—On the 24th of July, 1854, I took a male specimen of a Psyche, which was new to me, flying round some beeches, at Mickleham. Mr. Doubleday now informs me it is this species, and that he has also a single specimen taken near Epping, among beeches: the wings are very long and narrow and of a pale brown colour.—*H. Tompkins; 44, Guildford Street, Russell Square, London, February* 11, 1859.

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TO CORRESPONDENTS.

I extremely regret my inability to publish with this number a larger portion of the arrears. Mr. Meade's paper on Arachnida, Mr. Spence Bates on Crustacea, the Proceedings of the Entomological Society, and a mass of other papers, unavoidably stand over. I anticipate the inquiry, "Why do you publish your own paper on the Mud-fish, seeing there is this press of contributions?" I reply, "Simply out of respect for the Society for which it was written more than a year ago." It may also probably be objected that an unusual quantity of matter is reprinted from other sources: this is likely to be increasingly the case: some *one* journal ought to be thus catholic in its contents, and I desire to make the 'Zoologist' that journal. The 'Naturalist' (now alas! no more), the 'Entomologist's Weekly Intelligencer,' the 'Field' newspaper and other periodicals frequently contain scraps of Natural History that ought to be preserved: it is especially my wish to make these, and indeed all periodicals that embrace Natural History in their scope, better known than they are at present. There ought to be no rivalry in science; the only object the single-minded can ever keep in view is the dissemination and preservation of knowledge; it is the only wealth that can be scattered and hoarded at the same time. I am well aware that a feeling exists that it is unwise and untradesman-like gratuitously to advertise what may be considered rival publications, and that no advertisement is so telling as a good extract. This may be commercially, but certainly not morally, worthy of a moment's consideration: let those who embark in such undertakings consider only the public good, and not aim at pecuniary profit; and then their labours will be as useful to others as they are pleasing to themselves. However numerous such undertakings may become they will always be heartily welcomed by the Editor of the 'Zoologist:' may their name be Legion! — Edward Newman.

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